SERVICE MANUAL

AKAI TAPE RECORDER

MODEL
X-355

ALSO APPLICABLE FOR MODEL X-355D

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I. SPECIFICATION

Style : Portable

Weight : 62.7 lbs. (28.5 kg)

Dimensions : 17-3/8″(H) × 16″(W) × 12-1/8″(D) (440(H) × 407 (W) × 310 (D) m/m overall, case closed.

Power Supply : 100, 110, 117, 120, 125, 130, 140
200, 210, 217, 220, 225, 230, 240 } V.A.C.
(Interchangeable)

Recording System: In-line 4 track stereo, monaural recording by using Cross-field bias head.

Tape Speed : 2 speeds: 7-½ ips (19cm/s), 3-¾ ips. (9.5cm/s) by using adaptor 15 ips (38cm/s) available.

Tape Speed Deviation : Within ±0.5% at 7-½ ips.
Within ±1.0% at 3-¾ ips.

Wow and Flutter: Less than 0.08% R.M.S. at 7-½ ips. (at normal play)
Less than 0.12% R.M.S. at 7-½ ips. (at reverse play)
Less than 0.14% R.M.S. at 3-¾ ips. (at normal play)
Less than 0.15% R.M.S. at 3-¾ ips. (at reverse play)

Fast Forward and Rewind Time : 45 seconds for either operation using a 1,200 feet recording tape at 50 cycles. 36 seconds at 60 cycles.

Frequency Response: 30 to 24,000 cps ± 3 db at 7-½ ips.
30 to 18,000 cps ± 3 db at 3-¾ ips.

Signal to Noise Ratio: Better than 45 db at normal play (7-½ ips, 3-¾ ips).
Better than 43 db at reverse play (7-½ ips, 3-¾ ips).

Distortion (total harmonics) : Within 3% at 1,000 c/s 0 VU (line output)
Within 5% at 1,000 c/s 0 VU (speaker output at 10 watts (8 Ω))

OUTPUT

Pre-amplifier Output : 1,228 V (0 VU) at using 1,000 c/s 0 VU recorded tape. Impedance 1.5 kΩ.

Main Output (speaker output): 20 watts at undistorted power output on each channel. Impedance 8 Ω.

INPUT

Line Input : More than 50 mV. Impedance 100 kΩ.

Microphone Input : More than 0.5 mV. Impedance 4 kΩ.

Cross-talk : Less than −80 db (Monaural)
Less than −45 db (Stereo)

Erase Ratio : Less than −70 db for all tracks.

Insulation Resistance : More than 10 MΩ

Insulation Durability : 1,000 V.AC. for more than one minute duration.

Monitor System (in recording) : With record output button at "IN":
Can be monitored the program being recorded by using
{ built-in speaker
stereo headphone
external speakers
crystal receiver

With playback output button at "IN":
Can be monitored the recorded signals from the playback head by using
{ built-in speaker
stereo headphone
external speakers
crystal receiver

Main Motor : Condenser starting, hysteresis synchronous 2 speeds (4-8 pole) motor.
Condenser capacity 3 μF (50 c/s)
2.5 μF (60 c/s)
More than 1/100 HP
Power factor 70%
Revolution 1,500-750 R.P.M. (50 c/s)
1,800-900 R.P.M. (60 c/s)

Torque Motor : Condenser starting induction motor.
Condenser capacity 3 μF
More than 1/100 HP
Power factor 70%
Revolution 1,450 R.P.M. (50 c/s)
1,740 R.P.M. (60 c/s)

Heads

Recording Head: Inline 4 track stereo and monaural.
Impedance: 135 Ω at 1,000 c/s
Gap: 4 microns

Playback Head : Inline 4 track stereo and monaural.
Impedance: 1,000 Ω at 1,000 c/s
Gap: 2 microns

Erase Head : Inline 4 track stereo.
Impedance: 750 Ω at 90kc.
Gap: 0.2 mm

Cross-Field Bias Head: Inline 4 track stereo.
Impedance: 750 Ω at 90kc.
Gap: 0.2 mm

Record Level Indicator : Vertical indication model "A" VU meter.

Internal Speakers: 6-½″ round wide range dynamic speaker.
Impedance: 8 Ω
Nominal power input: 4W
Maximum power input: 6W
Frequency response: 50-10,000 ±10db.

Transistor Used : 2SB443Ⓐ × 4
2SB75Ⓕ × 2 } Pre-amplifier
2SB75Ⓑ × 10
2SB75Ⓐ × 2
2SB370AⒶ × 2 } Main amplifier
2SB338Ⓐ × 4
2SB370AⒷ × 2 Oscillator

Selenium Used : SPN-01 × 2 Bridged selenium rectifier
12C-2 × 1 Center top selenium rectifier

Silicone Diode Used : SE-05a × 1
SL-150 × 1
SW05-a × 1

Reels Used : With adaptor, reels up to 10-½″ can be used.

II. MEASURING METHOD

TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape.
   Playback on the tape recorder to be tested tape pre-recorded at 1,000 cps ±0.1% for measuring tape speed deviation. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation from the resulting deviation of the measured frequency.
2. Method involving use of timing tape (designed for tape speed measurement).

This method utilizes a timing tape marked at intervals of 7-½″. The running time of the tape over 60 marked section is measured in order to calculate the deviation of the tape speed. In application of this method, however, it should be borne in mind that should the timing tape stretch or contract, measurement error is inevitable, so that it is necessary to measure the total length of the tape in advance.

WOW AND FLUTTER

Playback the 3,000 cps pre-recorded tape whose wow and flutter level is guaranteed to be smaller than 0.07% for measurement by means of a wow meter. It is also possible for a 3,000 cps sine wave to be recorded and played for measurement by means of the wow meter. In this case, however, the wow meter indicates a value as much as twice the value given in the specifications on the first page.

FREQUENCY RESPONSE

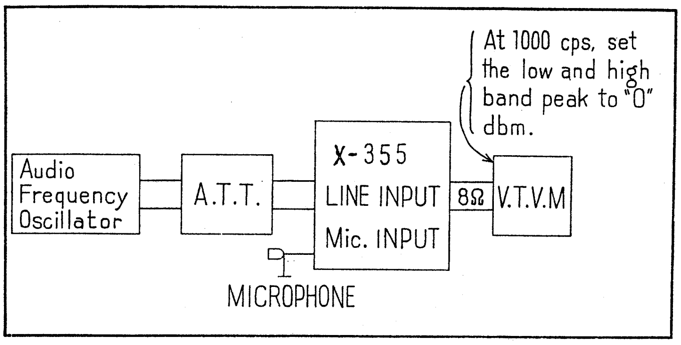
RECORD:

1) Give a sine wave of 1,000 c/s to the Line Input of the recorder to be tested through an attenuator from an audio frequency generator.
2) Push the "Record Output Button" and adjust the line input volume so that the VU meter needle indicates "0" VU.
3) Under the condition described in (2), lower the input level 16 db by means of the attenuator.
4) Connect a microphone to the Microphone Input.
5) Start recording. Control the microphone input level and the spot frequency in the range of 30 cps to 25,000 cps from the audio frequency generator and record by talking.

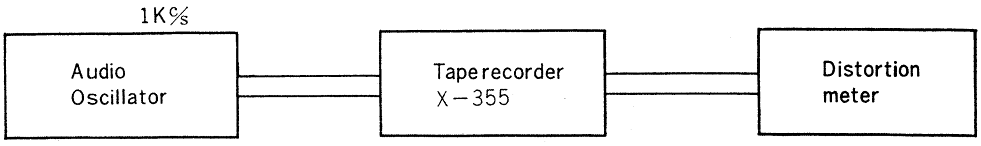
★ Remarks: After announcing the frequency of each point, the microphone volume should immediately be rotated back to minimum.

PLAYBACK:

6) Place the "Record Output Button" in the OUT position and push the "Playback Button"
7) Set the Equalizer Switch on 7-½″ or 3-¾″ position.
8) Set the Tone Switch on "Flat" position.
9) Terminate "External Speaker Output" of the recorder with 8 Ω resistor and connect a Vacuum Tube Volt Meter (V.T.V.M with milli volts scale).
10) Playback the tape previously recorded.
11) Adjust the output level to "0" dbm at "1,000 c/s" as indicated on the V.T.V.M. by adjusting the loudness volume.
12) Playback the recorded spot frequencies with the conditions in (11); make a memo of output level and plot the value on a graph.


At 1000 cps, set the low and high band peak to "0" dbm.
Audio Frequency Oscillator
A.T.T.
X-355
LINE INPUT
Mic. INPUT
8Ω
V.T.V.M
MICROPHONE

TOTAL HARMONIC DISTORTION FACTOR



Connect the measuring instrument as shown above, and record the 1,000 cps sine wave at "0" VU. Playback the resultant signal and measure the overall distortion factor. Measure the noise level of the tape recorder with the tape removed; connect the audio oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator.

The required distortion factor may be obtained from the results of the above measurement by the following formula:

$$\boldsymbol{d_0 = d - d_1 - d_2}$$

where, d_0 = Required
d = Overall distortion factor
d_1 = Noise level
d_2 = Distortion factor of the oscillator

(Note: New tape of particularly good quality should be used for measurement of the distortion factor).

SIGNAL TO NOISE RATIO

Set the Tone Switch on "Flat" position and playback a tape containing a 1,000 cps sine wave recorded at "0" VU level on a standard recorder. Connect an 8 Ω resistor to the output terminals of the recorder and measure its output. Then remove the tape and measure the noise level under the same conditions. Convert into decibels each of the measured values.

POWER OUTPUT

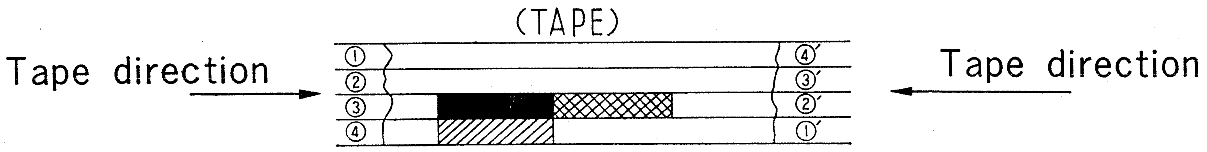
Playback a tape containing a sine wave of 1,000 cps recorded at 0 VU on a standard recorder. Measure the voltage at the output of the recorder to be tested when terminated with 8 Ω.

Then use the following formula:

$$P = \frac{E^2}{R}$$

P = Desired output (W)
E = Measured voltage (R.M.S.)
R = 8 Ω

CROSS TALK (Cross talk between the tracks)



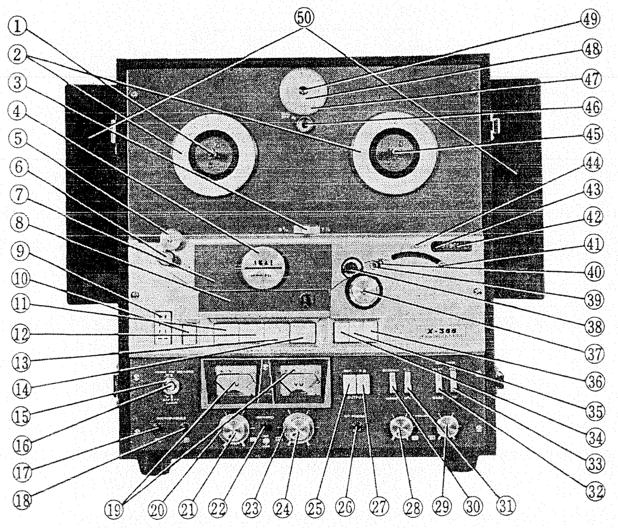
As shown in the figure, first record a 1,000 cps sine wave on track No. 3 at +3 VU level. Next, remove the 1,000 cps input signal and record under a non-input condition.

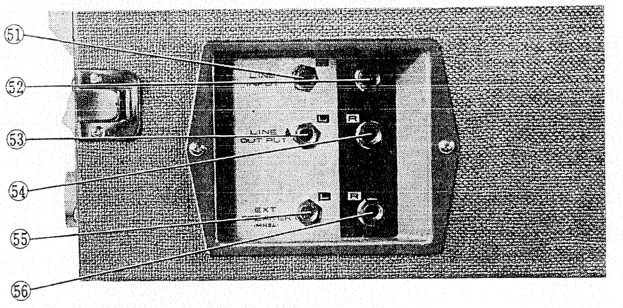
Then, playback the tape on track No. 3 and No. 1 (reversed condition of tape) through the 1,000 cps B.P.F. (Band Pass Filter, Sensitivity....1 : 1) and obtain a ratio between the two from the following formula.

$$C = 20\log\frac{E_0}{E_2 - E_1}\text{(db)}$$

C = Desired cross talk ratio (db)
E_0 = 1,000 cps signal output level ■
E_2 = 1,000 cps cross talk output level ▨
E_1 = No-input signal record level ▩

III. CONTROL LOCATION

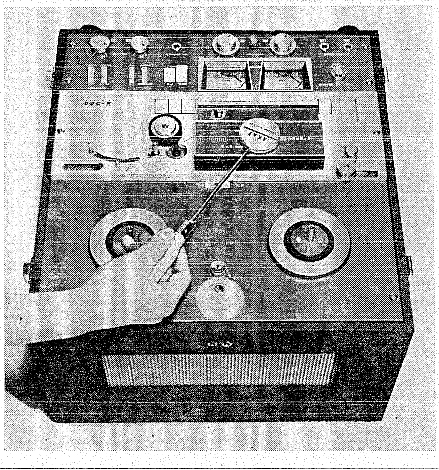




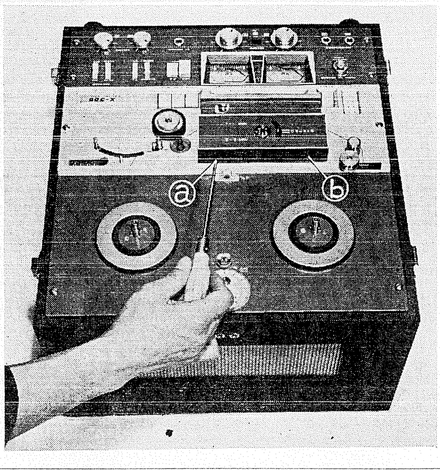
① Supply Reel Shaft
② Guard Circle
③ Speed Change Switch
④ Track Selector Knob
⑤ Tape Guide
⑥ Tape Guide Roller
⑦ Head Cover, A
⑧ Head Cover, B
⑨ Remote Control Socket
⑩ Power Button
⑪ Stop Button
⑫ Rewind Button
⑬ Play Button
⑭ Fast-Forward Button
⑮ Record Safety Lock
⑯ Record Safety Button
⑰ Microphone Jack (Left)
⑱ Microphone Jack (Right)
⑲ VU Meter
⑳ Line Volume Control (Left)
㉑ Microphone Volume Control (Left)
㉒ Recording Lamp
㉓ Line Volume Control (Right)
㉔ Microphone Volume Control (Right)
㉕ Record Output Button
㉖ Stereo Headphone Jack
㉗ Playback Output Button
㉘ Volume Control (Left)
㉙ Volume Control (Right)
㉚ Function Switch
㉛ Equalizer Switch
㉜ Tone Switch
㉝ Speaker ON/OFF Switch
㉞ Repeat Button
㉟ Reverse Button
㊱ Shut-Off Button
㊲ Pinch Wheel
㊳ Capstan Shaft
㊴ Auto. Reverse Pin (Ⅰ)
㊵ Auto. Reverse Pin (Ⅱ)
㊶ Tension Arm
㊷ Index Counter
㊸ Re-set Button
㊹ Tape Holder
㊺ Take-up Reel Shaft
㊻ Dial Off Button
㊼ Auto. Tape Count Meter
㊽ Set Dial
㊾ Manual Reverse Button
㊿ Reflector
(51) Line Input Jack (Left)
(52) Line Input Jack (Right)
(53) Line Output Jack (Left)
(54) Line Output Jack (Right)
(55) Ext. Speaker Jack (Left)
(56) Ext. Speaker Jack (Right)

IV. PROCEDURE FOR REMOVAL

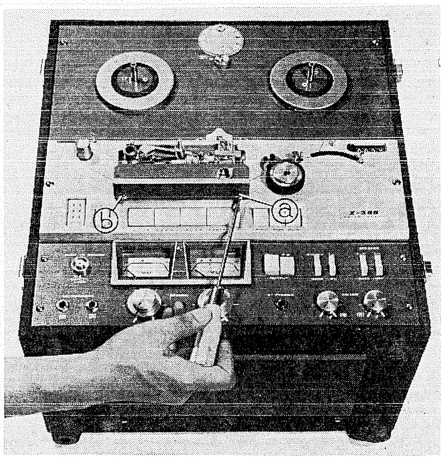
(1) Loosen the RETAINING SCREW of TRACK SELECTOR KNOB by using a Phillips-headed screw driver (3 millimeters in diameter) and remove the TRACK SELECTOR KNOB by hand.



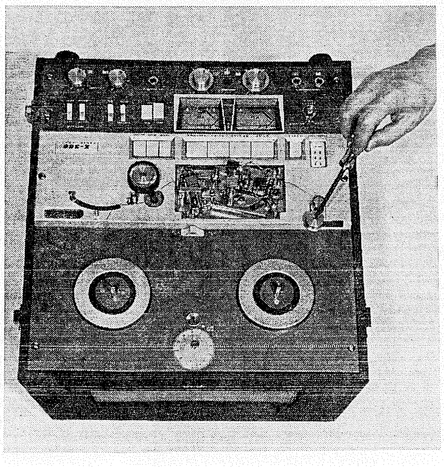
(2) Loosen the RETAINING SCREWS (marked (a) and (b)) of the HEAD COVER (A) by using the same screw driver and remove the HEAD COVER (A) by hand.



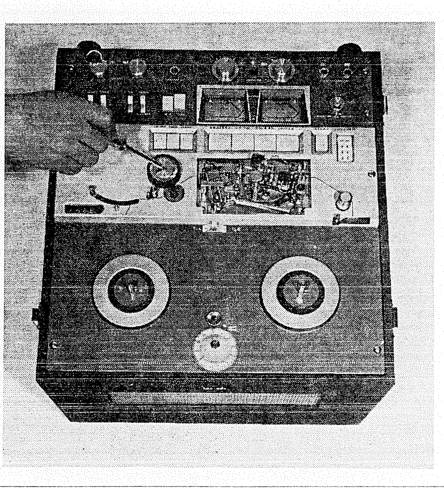
(3) Loosen the RETAINING SCREWS (marked (a) and (b)) of the HEAD COVER (B) and remove the HEAD COVER (B) in the same manner.



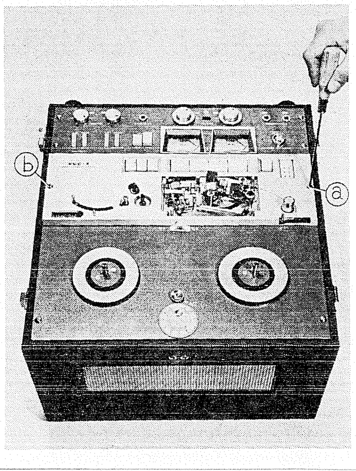
(4) Loosen the RETAINING SCREW of the TAPE GUIDE by using a larger (4 millimeters in diameter) Phillips-headed screw driver and remove the TAPE GUIDE by hand.



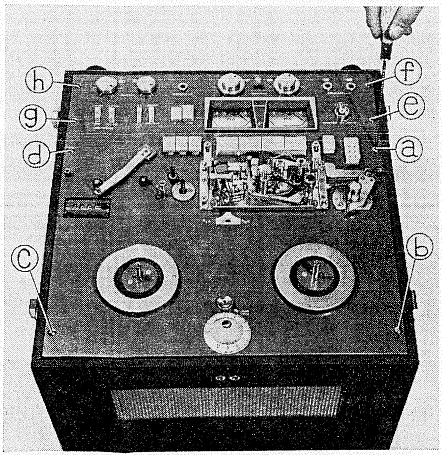
(5) Loosen the RETAINING SCREW of the PINCH WHEEL by using the same screw driver and remove the PINCH WHEEL by hand.



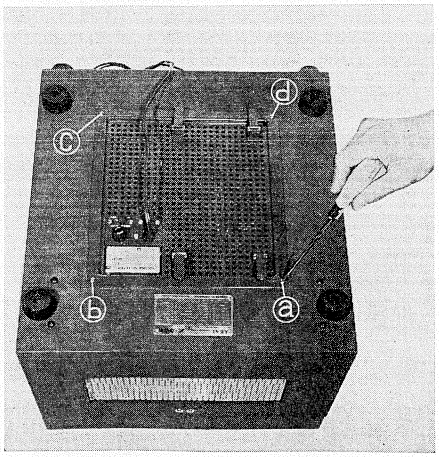
(6) Loosen the RETAINING SCREWS (marked (a) and (b)) of the FRONT PANEL by using the same screw driver and remove the FRONT PANEL by hand. In this case, set the SHAFT of the TAPE GUIDE on the left of the FRONT PANEL.



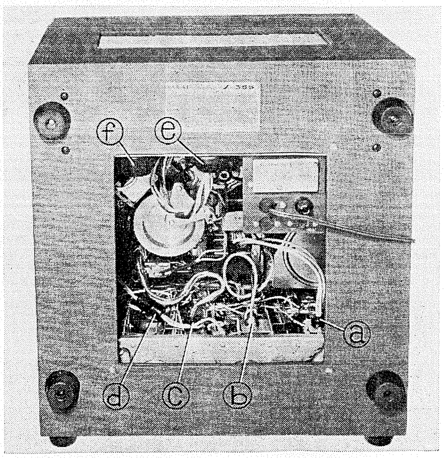
(7) Loosen the SCREWS (marked from (a) to (h)) by using the same screw driver.



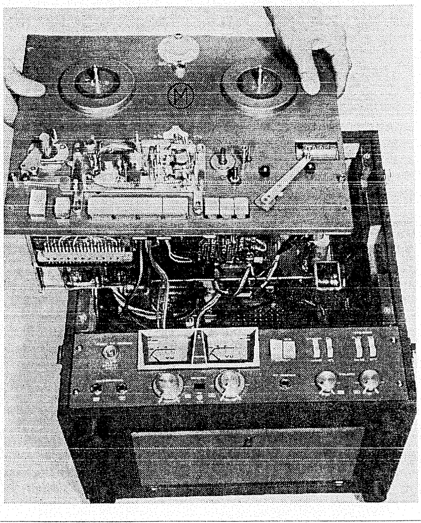
(8) Loosen the RETAINING SCREWS (marked from (a) to (d)) of the VENTILATOR by using the same screw driver and remove the VENTILATOR by hand.



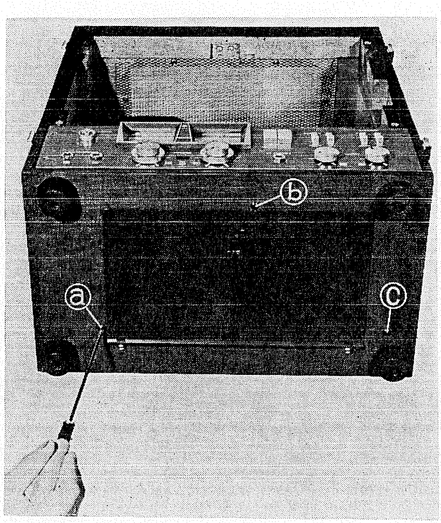
(9) Remove the PLUGS (marked (a) to (f)) carefully by hand.



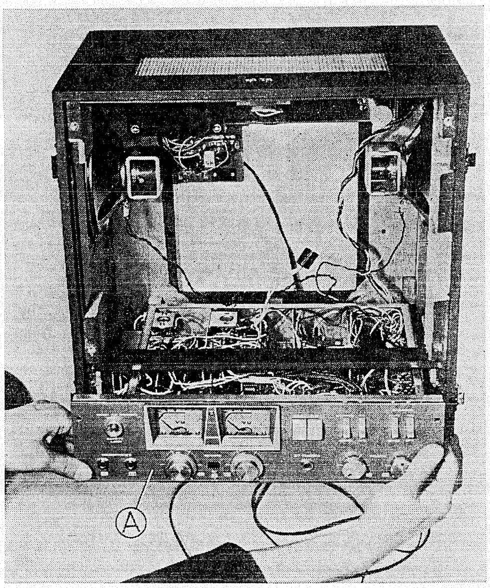
(10) Remove the TAPE TRANSPORT MECHANISM ASSEMBLY (M) by slowly lifting it from the case as shown in picture.



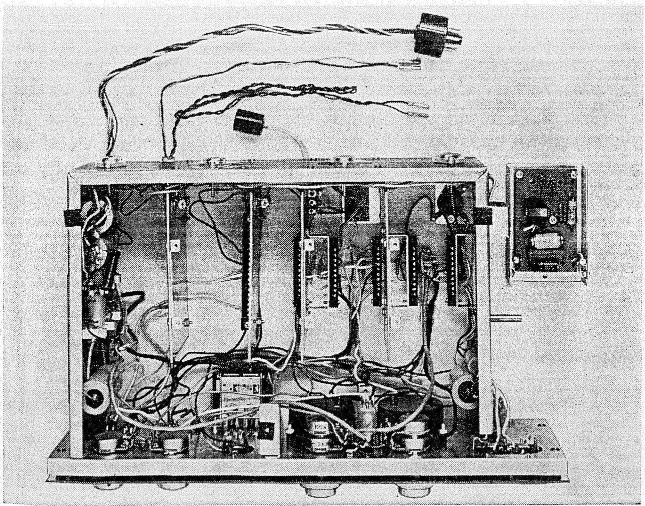
(11) Loosen the RETAINING SCREWS (marked (a) to (c)) of the AMPLIFIER SHEATHING by using the same screw driver.

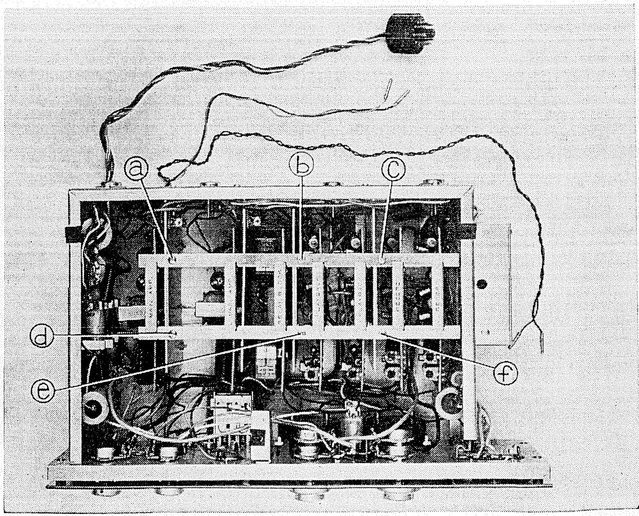


(12) Disconnect the SPEAKER TIPS (marked (a) to (b)) and remove the AMPLIFIER ASSEMBLY (A) from the case by hand.



(13) (14) Loosen the RETAINING SCREWS (marked from (a) to (f)) by using a smaller (3 millimeters in diameter) Phillips-headed screw driver and remove the CARDS of MAIN AMPLIFIER, PLAYBACK, RECORD and RELAY BLOCK by hand.

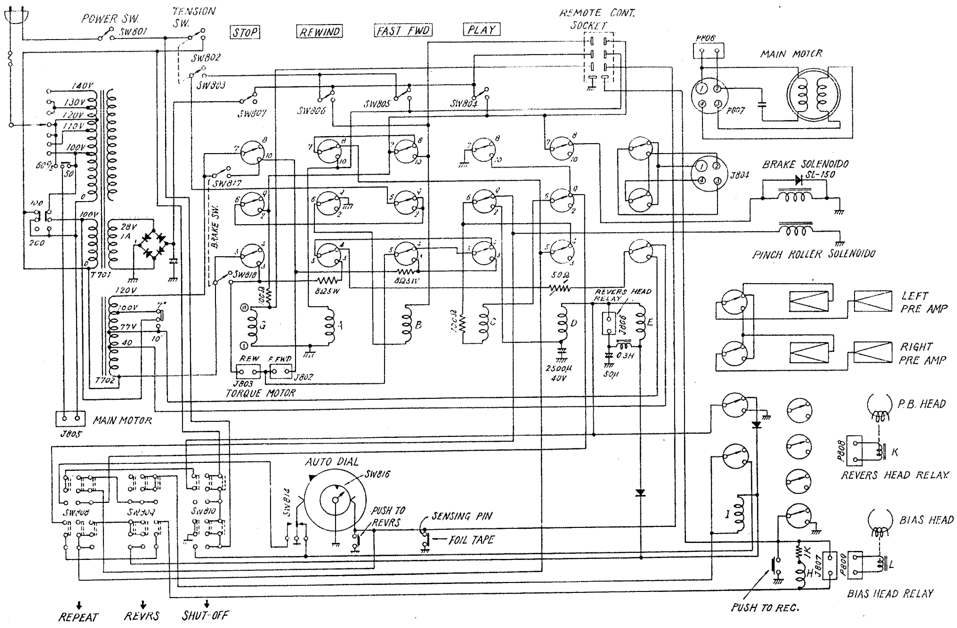




V. TRANSPORT MECHANISM

Fig. 1 illustrates the basic circuit arrangement of the transport mechanism which is a modification of the schematic diagram attached to the Operator's Manual and which gives better understanding of the functions and operation of the tape transport.

FIG. 1


POWER SW.
SW801
TENSION SW.
SW802
SW803
STOP
REWIND
FAST FWD
PLAY
REMOTE CONT. SOCKET
SW807
SW806
SW805
SW804
P806
MAIN MOTOR
P807
140V
130V
120V
110V
100V
60%
50
100
200
100V
28V 1A
T701
SW817
BRAKE SW.
SW818
J804
BRAKE SOLENOIDO SL-150
PINCH ROLLER SOLENOIDO
8Ω5W
8Ω5W
50Ω
120V
100V
77V
40
7"
10"
T702
G
A
B
C
D
E
100Ω
100Ω
REVERS HEAD RELAY
J806
2500μ 40V
0.3H
50μ
REW
F.FWD
J803
J802
TORQUE MOTOR
MAIN MOTOR
J805
LEFT PRE AMP
RIGHT PRE AMP
P.B. HEAD
P808
K
REVERS HEAD RELAY
AUTO DIAL
SW816
SW814
PUSH TO REVRS
SENSING PIN
FOIL TAPE
SW808
SW809
SW810
I
1K
H
J807
P809
L
BIAS HEAD
BIAS HEAD RELAY
PUSH TO REC.
REPEAT
REVRS
SHUT-OFF

1. STOP

Load a tape and set the recorder to play condition. Put the power switch (SW801) to the ON position. Current flows as indicated by red line in Fig. 2 and the main motor starts and the VU meter lamp lights. In this state of tape transport, no relay or no solenoid coil is operated.

2. PLAY

As the play button is depressed under the STOP condition, the relay control current flows through the play button micro switch (SW804) as indicated by red dotted line in Fig. 3 and the relay G is energized and locked by contact 6-2. The relay G thus locked continues to be energized even with the finger released from the play button. The current flow is shown in red line. The current flows through contacts 7-10 and 5-3 of the relay G and into two torque motors. The center taps of these motors are connected through the contacts of the relays A, B, C and E to the 40V terminal of the power transformer (T702). The tape is thus given proper tension.

At the same time, the current flows into the brake solenoid and pinch wheel solenoid so that the brake band is let free and the pinch wheel is pressed against the capstan thereby causing the tape to travel at constant rate of speed.

While in tape travel, the stop button may be depressed and the stop micro switch (SW807) put in OFF position, so that the relay control current is discontinued and the relay G unlocked, bringing the transport mechanism to a stop.

As the tape is fully wound onto the take-up reel and the tension arm dropped, the tension switch (SW803) turns into OFF position, thereby the transport mechanism is reverted to a stop.

3. FAST FORWARD

Depressing now the fast forward button under the STOP condition causes the relay control current to flow through the micro switch (SW805) as shown by red dotted line in Fig. 4 thereby switching the relay A into ON position. As the relay A is thus locked, the relay control current flows along the red line in Fig. 4 until the relay G and brake solenoid become energized to release the brakes. 120 volts are applied across 8 Ω 5W resistor to the fast forward motor as shown in Fig. 5, whereupon the fast forward motion of the tape is effected. This resistor is intended to prevent transient pulse generated when switching the relay contacts.

FIG. 2

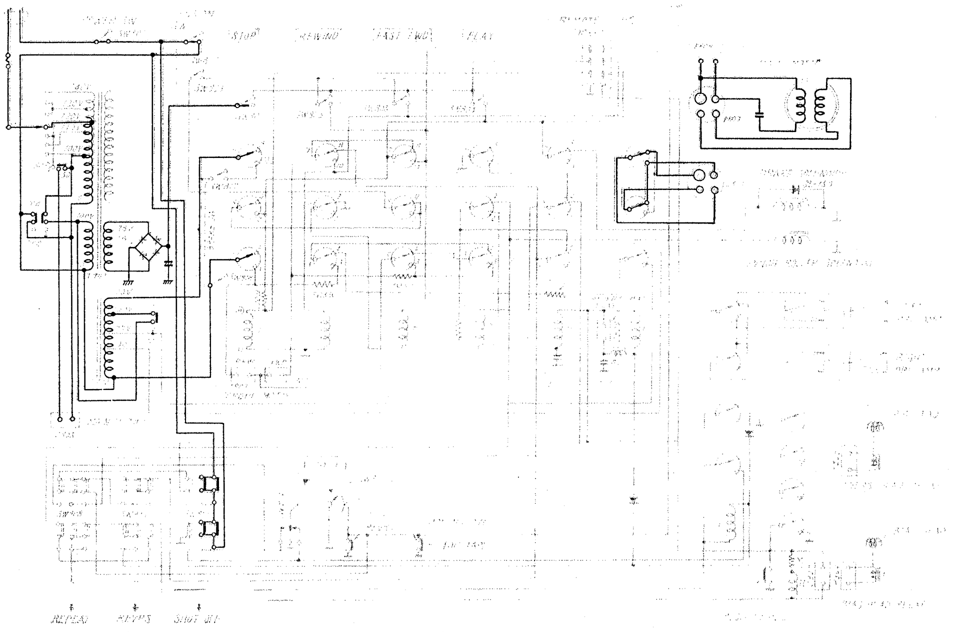

STOP
REWIND
FAST FWD
PLAY
REPEAT
REVRS
SHUT OFF

FIG. 3

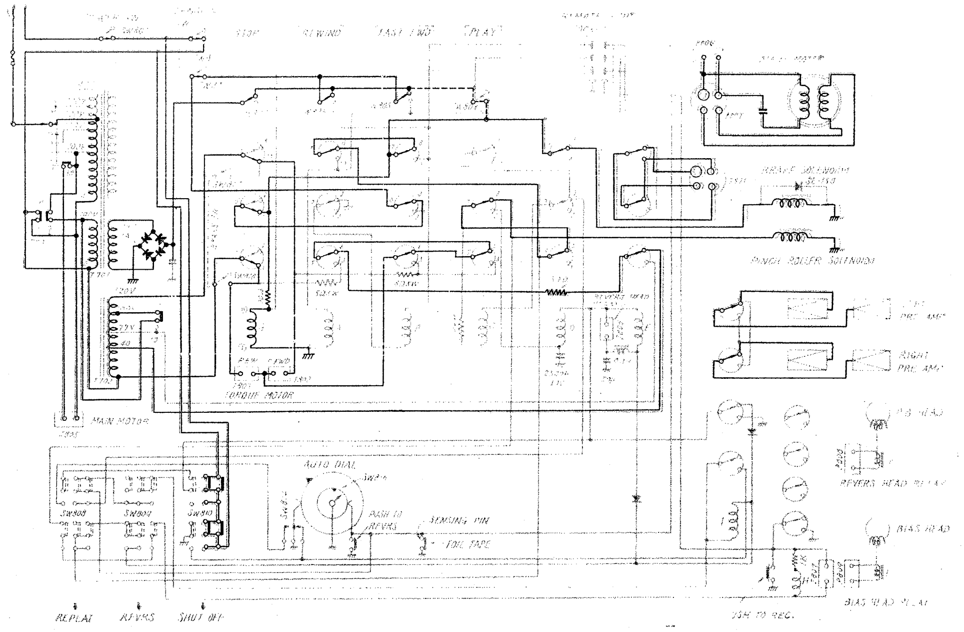

STOP
REWIND
FAST FWD
PLAY
120V
72V
40
T701
T702
TORQUE MOTOR
MAIN MOTOR
SW808
SW809
SW810
AUTO DIAL
PUSH TO REVRS
SENSING PIN
FOIL TAPE
BRAKE SOLENOID
PINCH ROLLER SOLENOID
REVERS HEAD
RIGHT PRE AMP
PRE AMP
PB HEAD
REVERS HEAD RELAY
BIAS HEAD
BIAS HEAD RELAY
PSH TO REC.
REPEAT
REVRS
SHUT OFF

FIG. 4

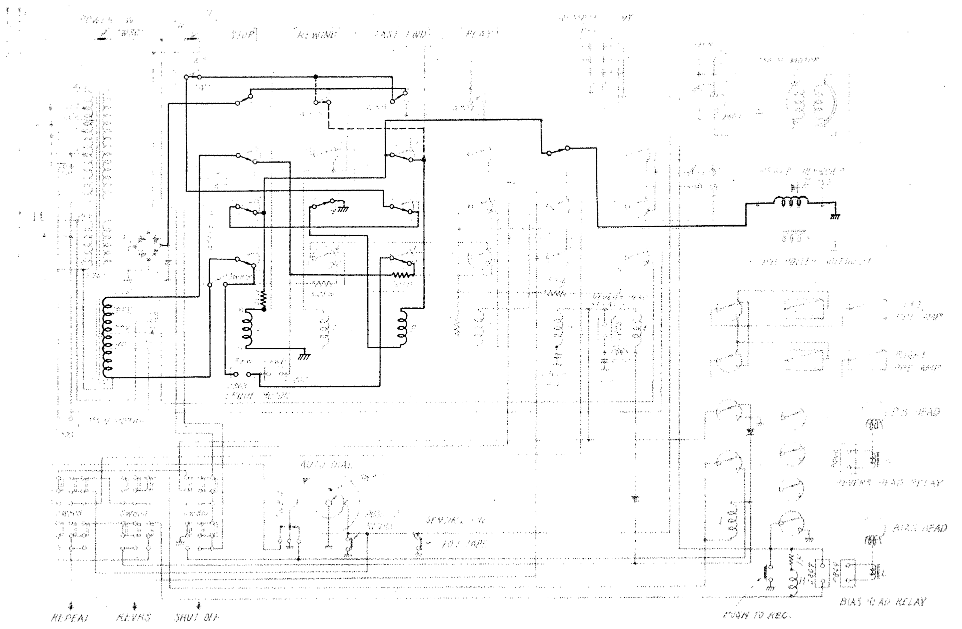
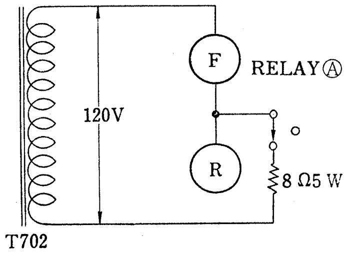

STOP
REWIND
FAST FWD
PLAY
AUTO DIAL
REPEAT
REVRS
SHUT OFF
PUSH TO REC.
BIAS HEAD RELAY

FIG. 5


F
RELAY Ⓐ
120V
R
8 Ω5 W
T702

F : Fast forward motor
R : Rewind motor

4. REWIND

Depressing the rewind button under the STOP condition causes the current to flow through the micro switch (SW806) as indicated by red dotted line in Fig. 6 so that the relay B is energized and locked by contact 7-10. The relay control current now flows as indicated by red line in Fig. 6 so that the relay G is energized and the brakes released, whereupon the rewind motor is supplied with 120 volts through 8 Ω 5W resistor as shown in Fig. 7. The rewind mode of operation thus takes place.

FIG. 6

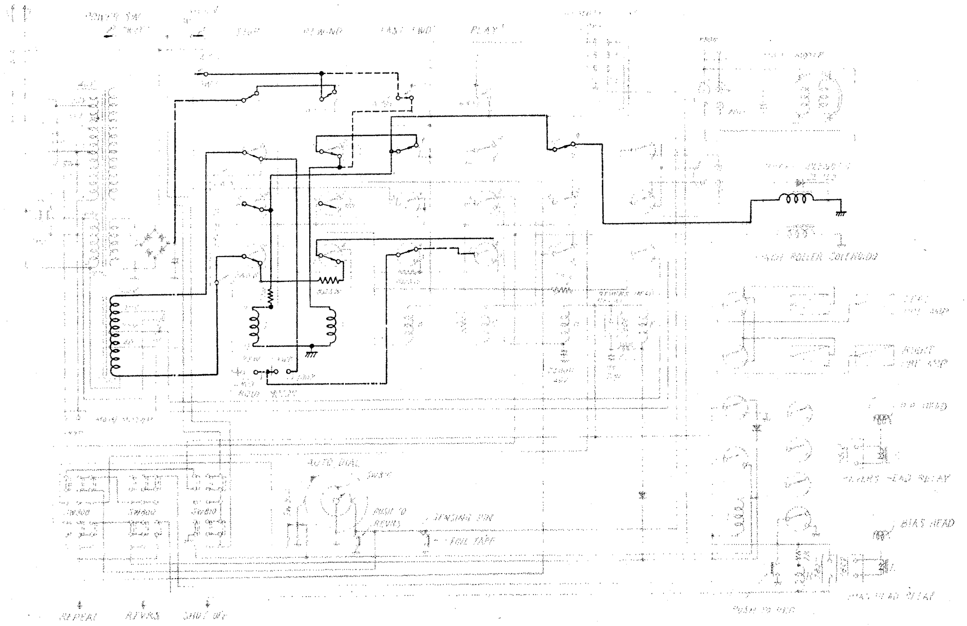
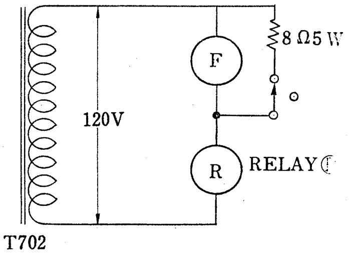

AUTO DIAL
REPEAT
REVRS
SHUT OFF
BIAS HEAD

FIG. 7


8 Ω5 W
F
120V
R
RELAY
T702

F : Fast forward motor
R : Rewind motor

REPEAT

a) REPEAT PLAY

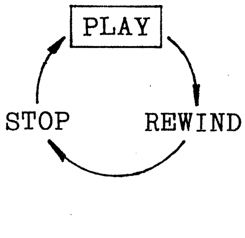
To establish the repeat play mode of operation of the tape recorder, the repeat button on the front panel should be first depressed thereby to put the repeat switch (SW808) in red-line position as shown in Fig. 8.

At a starting end of the tape, the automatic tape counter meter dial B should be calibrated by bringing its zero point in registry with the arrow point of the dial-off button dial C, then set the set dial to its arrow pointing any desired area of the tape……near the terminating end or any portion of the tape desired for repeated play, as illustrated in Fig. 9. Exact tape length in this case varies with the type of tape used; therefore, it is advisable to check how far the zero point of the dial B has advanced when the tape is fully taken up by fast forward and set the arrow of the dial A at that point.

Now, press the play button so that the relay control current flows as indicated by red line in Fig. 8, thus establishing the play mode of operation already described in Paragraph 2.

The dial B turns in the direction of the dotted line in Fig. 9 arrow as the tape advances.

FIG. 8



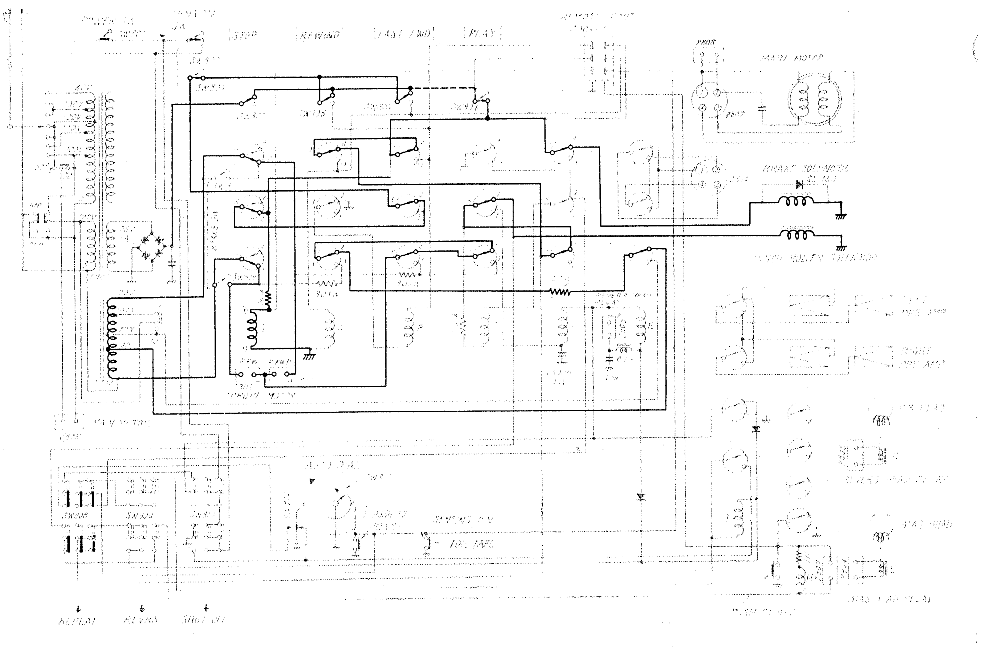
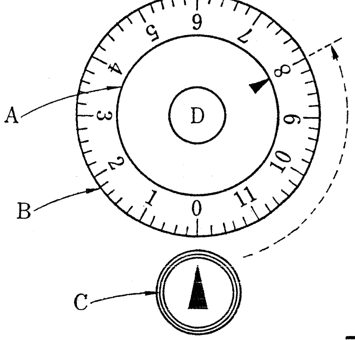


FIG. 9



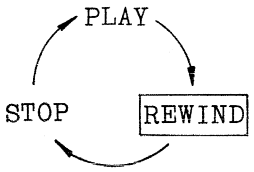
b) REPEAT REWIND

The dial B, in repeat play, continues to turn counter clockwise until its "0" point comes in registry with the arrow of the dial A as shown in Fig. 11. Then, the automatic dial switch (SW816) in Fig. 10 is put in ON position and the relay control current flows in the manner shown by red line in Fig. 10 so that the relay C and relay G are energized thereby to effect the automatic rewind operation. Subsequently, the "0" point of the dial B rotates in the direction of the dotted line arrow as shown in Fig. 11 and the automatic dial switch (SW816) is put in OFF position. However, inasmuch as the relays C and G are respectively locked by contacts 7-10 and 6-2, the rewind mode of tape motion continues while the capacitor C812 (2500 μF) is charged with 35 volts through the contact 6-2 of relay C.

When the manual reverse button (shown at D in Fig. 9) is depressed any time during the repeat mode of operation, the automatic mode of rewind operation takes place just in the same manner as it would be with the switch (SW816) put in ON position.

With a tape more than 2400 feet long, the dial-off button may be set in DIAL-OFF position and the dial B stopped, whereupon the tape may be attached at the terminating end with a foil tape for contact with the sensing pin. That foil tape causes the transport mechanism to switch on automatic rewind.

FIG. 10


PLAY
REWIND
STOP

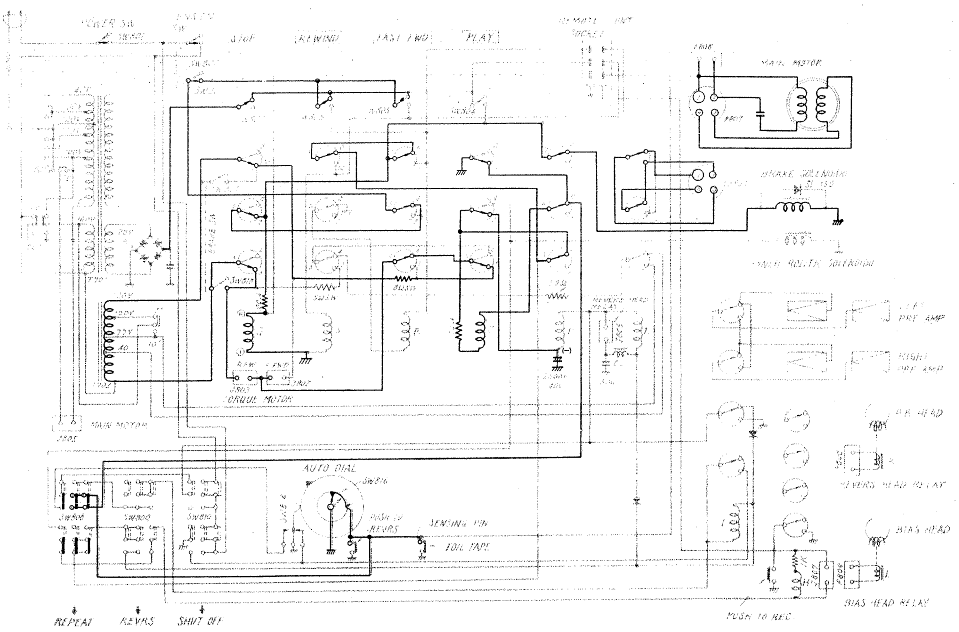
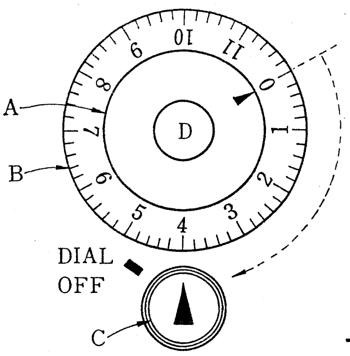

STOP
REWIND
FAST FWD
PLAY
MAIN MOTOR
BRAKE SOLENOID
PINCH ROLLER SOLENOID
LEFT PRE AMP
RIGHT PRE AMP
P.B HEAD
REVRS HEAD RELAY
BIAS HEAD
BIAS HEAD RELAY
PUSH TO REC
AUTO DIAL
PUSH TO REVRS
SENSING PIN
FOIL TAPE
REPEAT
REVRS
SHUT OFF

FIG. 11

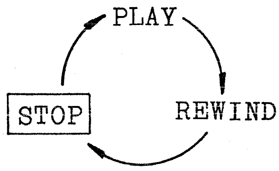

A
B
C
D
DIAL OFF
0
1
2
3
4
5
6
7
8
9
10
11

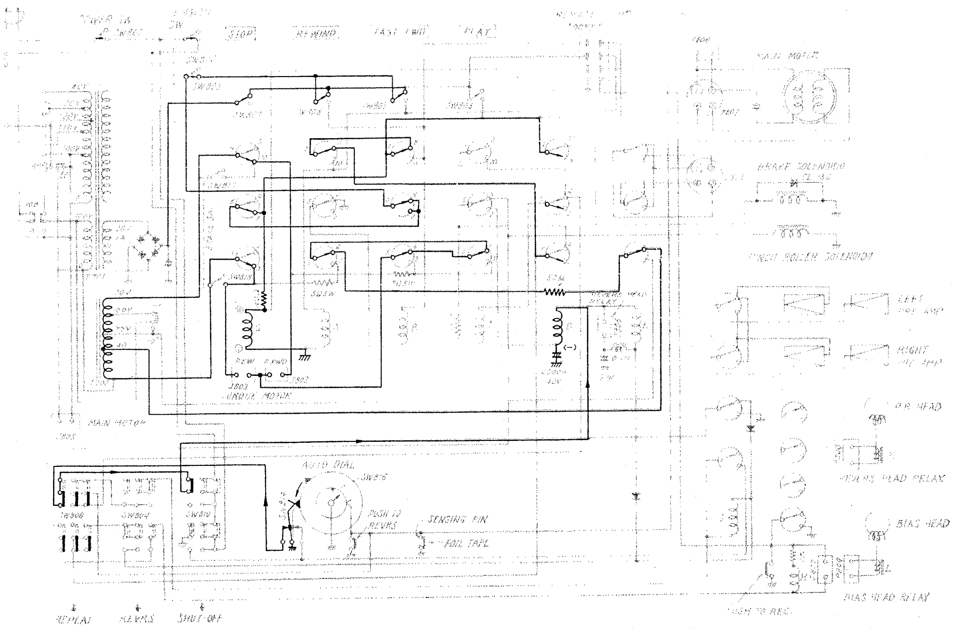
c) REPEAT CYCLE STOP

While the machine is in the repeat rewind mode operation with the dial B kept in the dotted line direction as shown at Fig. 11, the "0" point of the dial B is at the same position with the arrow point of the dial C so that the switch (SW814) is put in ON position by convexity of the dial B. Consequently, the 35 volt potential established in the capacitor during repeat rewind is discharged through the relay D coil and the contacts of the switches (SW808, 810 and 814). This discharge current causes the relay D to be energized so that the current flow through the brake solenoid and pinch wheel solenoid is discontinued the and then the tape stops.

It takes 3 to 4 seconds to discharge the capacitor C812, while the tape is held to a stop. As the capacitor C812 is completely discharged, the relay D automatically becomes de-energized and the transport resumes the repeat play mode of operation to begin reproduction of the tape. The operation of the machine just described repeats itself as long as the hand is off the stop button.

FIG. 12


PLAY
STOP
REWIND

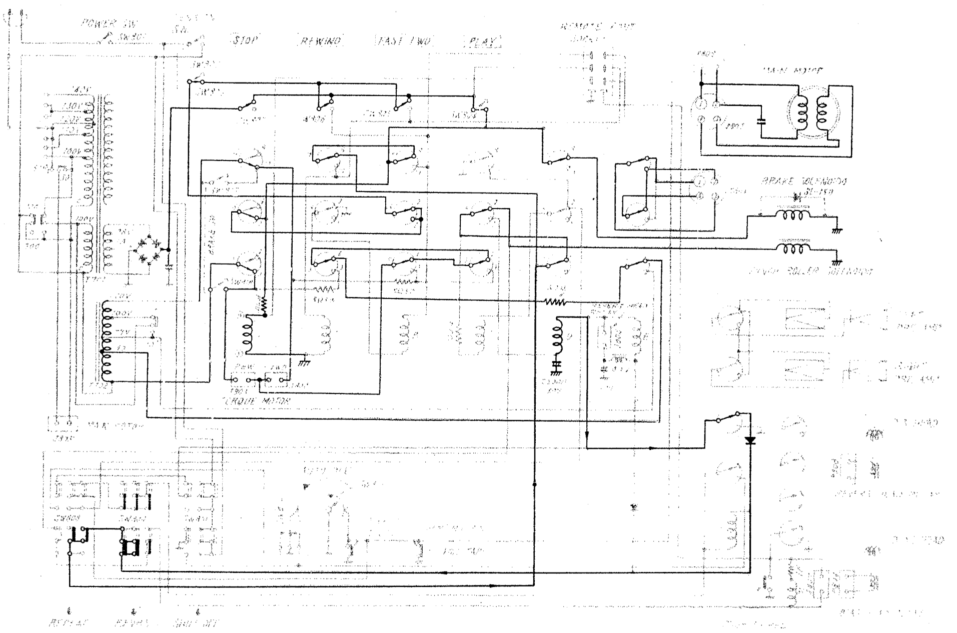

STOP
REWIND
FAST FWD
PLAY
MAIN MOTOR
BRAKE SOLENOID
PINCH ROLLER SOLENOID
LEFT PRE AMP
RIGHT PRE AMP
P.B HEAD
REVRS HEAD RELAY
BIAS HEAD
BIAS HEAD RELAY
PUSH TO REC
AUTO DIAL
PUSH TO REVRS
SENSING PIN
FOIL TAPE
REPEAT
REVRS
SHUT OFF

6. REVERSE

a) REVERSE CYCLE "NORMAL PLAY"

To establish a reverse play mode of operation, the reverse button on the front panel is depressed so that the reverse switch (SW809) is put in the red line position as shown in Fig. 13. In just the same manner as with the repeat play mode of operation, the "0" point of the dial B in Fig. 9 is brought in registry with the arrow marking on the dial C at an initial turn of tape roll, while the arrow of the dial A is set to a terminating end of tape or to any desired point on tape for reverse play. With the play button depressed in this manner, the relay control current flows in a manner indicated by red line in Fig. 13. However, at the instant of depressing the play button there flows a charge current through the coil of relay D into the capacitor C812 (2500 μF) as shown by black line in Fig. 13, so that the relay D is energized for about 2 or 3 seconds blocking the flow of current through the brake solenoid and the pinch wheel solenoid. So, with the play button depressed, a few seconds must be anticipated until the charge current to the capacitor diminishes, before the relay D is de-energized to begin normal play of the tape.

FIG .13



b) REVERSE CYCLE "NORMAL PLAY——→STOP"

The "0" point of the dial B rotates in the direction of the dotted line arrow in Fig. 9 according to the tape advance, and comes in registry with the arrow on the dial A, whereupon the automatic dial switch (SW816) is put in ON position and the relay I energized thereby discharging the capacitor C812 through the contact of relay I. The discharge current from the capacitor flows through the coil of relay D. The relay D thereby energized for a few seconds blocks the flow of current through the brake solenoid and the pinch wheel solenoid so that the machine is held to a stop.

The tape may be stopped for 3 or 4 seconds any time during normal play according to Paragraph. 5 by either when the manual reverse button is pressed or when the foil tape on the record tape contacts the sensing pin, just in the same manner as the switch (SW816) put in ON position. At which time, the current flows through the contact of relay I and the coil of relay E. As the relay E is thereby energized and the contacts 7-10 and 6-2 are closed in, the main motor starts to reverse.

FIG. 14

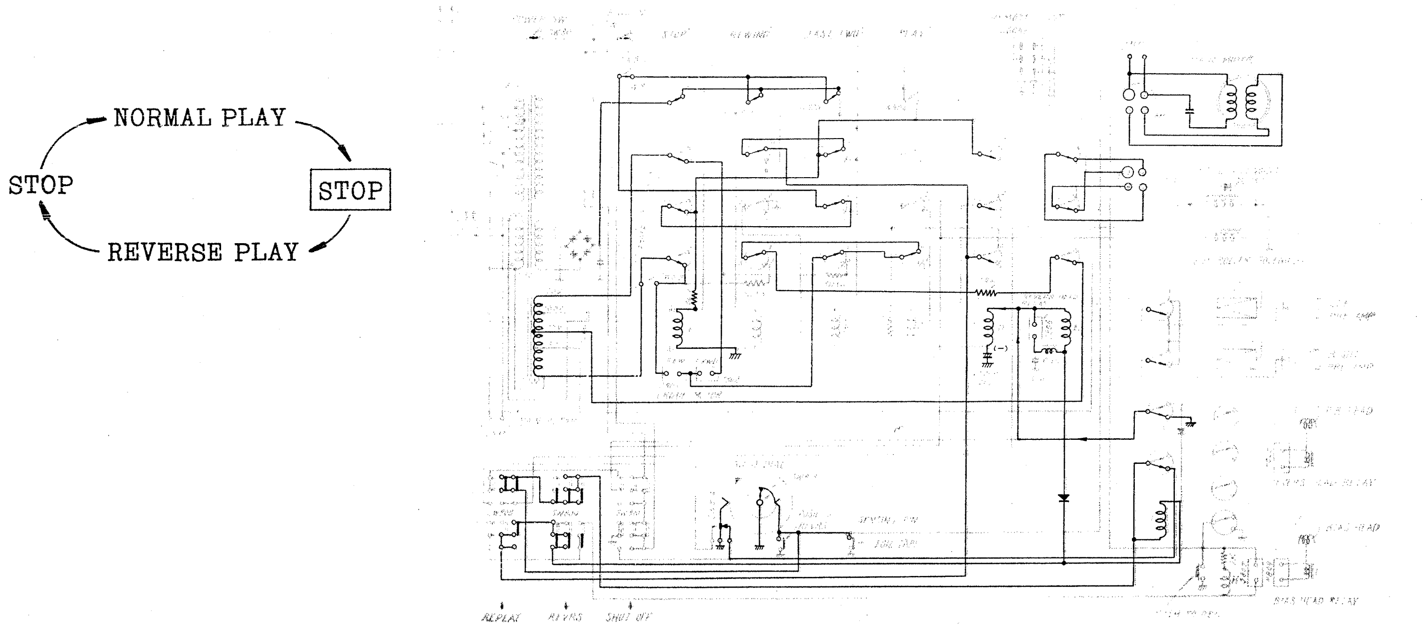
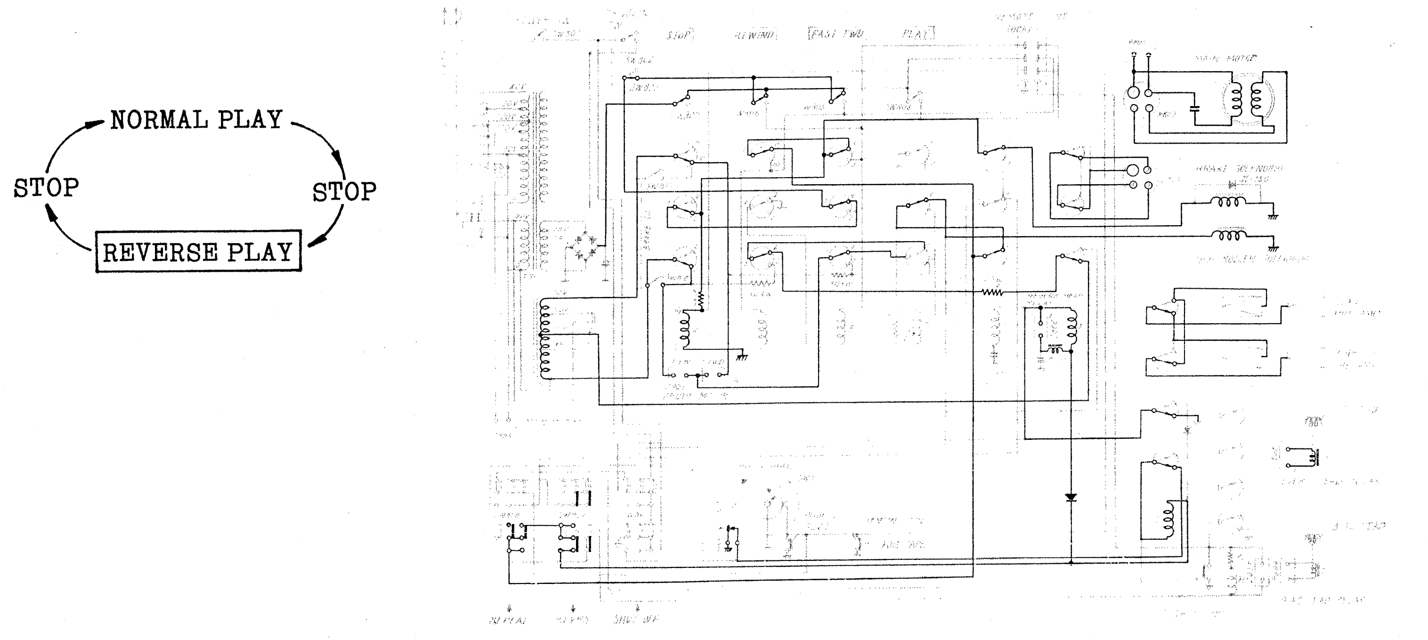


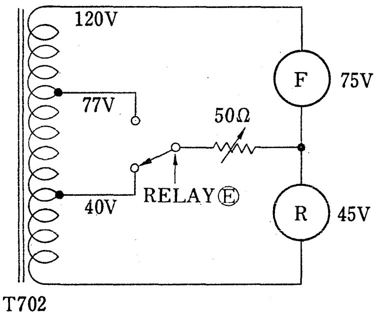
FIG. 15



c) **REVERSE CYCLE "REVERSE PLAY"**

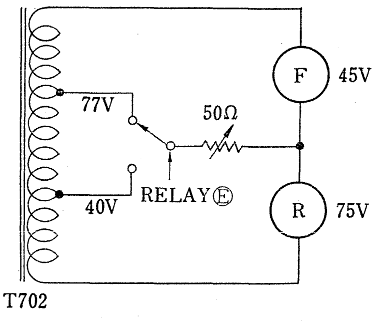
With the machine held to a stop in the manner described, as the charge current diminishes with charging of the capacitor C812, the relay D becomes de-energized so that the current flows through the brake solenoid and the pinch wheel solenoid. Consequently, the tape begins reverse motion as the main motor has already reversed, thus establishing a reverse play mode of operation. The current simultaneously flows into the reverse head relay coil connected parallel with the coil of relay E, so that the playback head is lowered to reproduce the 2 and 4 tracks of the tape. The left and right pre-amplifiers may be switched over by the relay I so that the recorded signal on the left channel is reproduced without fail from the line output designated at this channel. For reverse play, tension in the tape may be adjusted by changing the voltage impressed on the torque motor in the manner illustrated in Figs. 16 and 17.

FIG. 16


120V
77V
50Ω
RELAY Ⓔ
40V
F
75V
R
45V
T702

Normal Play

FIG. 17


77V
50Ω
RELAY Ⓔ
40V
F
45V
R
75V
T702

Reverse Play

F : Fast Forward Motor

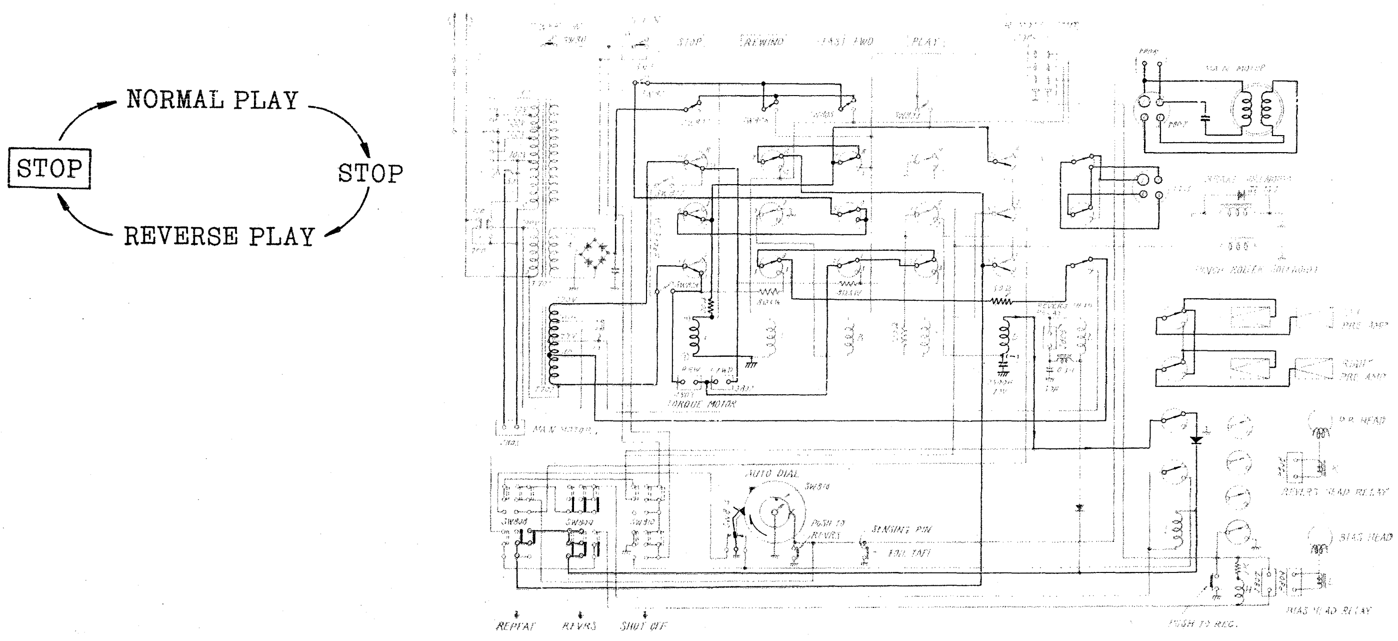
R : Rewind Motor

d) REPEAT CYCLE "REVERSE PLAY——→STOP"

With the tape advancement on reverse playback, the automatic tape counter meter dial B rotates in the direction of the dotted line arrow as shown in Fig. 11. As the "0" point on the dial B comes at the arrow point on the dial C, the contact of dial switch (SW814) is raised by the convexity of the dial B as illustrated in Fig. 18, and the contacts Y-Z are de-energized, hence, the relay I is de-energized as the charge current for the capacitor C812 flows through the coil of relay D as shown by red line in Fig. 18. The relay D energized prevents the current from flowing through the brake solenoid and the pinch wheel solenoid thereby holding the machine to a stop. De-energization of the relay I stops the flow of current through the relay E and coil of the reverse head relay, so that the main motor is switched back to forward rotation and the voltage applied to the torque motor switched to normal play. The preamplifiers resume a normal play mode of performance. In this manner, the relay D continues to be energized (for about 3 to 4/seconds) until the charge current of the capacitor C812 is finally diminished. As the relay D is again de-energized, the tape begins to travel in the normal play fashion.

Thus, the tape transport in the reverse cycle mode of operation repeats the sequence of Normal Play——→Reverse Play——→Stop.

FIG. 18


NORMAL PLAY
STOP
STOP
REVERSE PLAY
STOP
REWIND
FAST FWD
PLAY
TORQUE MOTOR
MAIN MOTOR
AUTO DIAL
SW814
SENSING PIN
REPEAT
REVRS
SHUT OFF
PUSH TO REC.

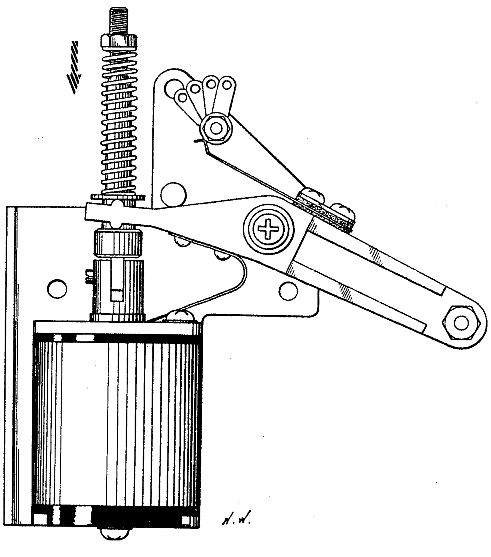
VI. MECHANISM ADJUSTMENT

1. ADJUSTMENT OF PINCH WHEEL

The proper pressure is applied to the pinch wheel by plunger action and spring tension.

The proper pressure to be applied to the capstan is between 1400-1500 grams and pressure above or below that range may cause wow and flutter. The pressure adjustment is made by turning an adjusting screw as shown by Fig. 19, where the direction of the arrow indicates increasing pressure and the other direction indicates decreasing pressure.

FIG. 19



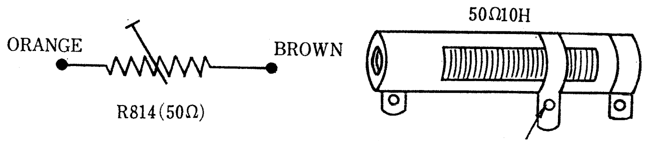
ADJUSTMENT OF TAKE-UP MOTOR

The take-up motor is a condenser (3μF) start 4-pole induction motor having optimum torque between 130 and 145 grams ranging when loaded with standard 7″ reel in "normal play". (as determined with tape wound on 5″ reel to a roll diameter of 60 mm using a bar gauge). The motor is run in this manner to insure that the tape is wound at a constant speed. The voltage supplied to the take-up motor during this operation may range from 75 to 80 V. A. C.

The optimum to torque (viz. optimum back tension) in the "reverse play" mode of operation ranges from 40 to 50 grams with a feed voltage of about 40 to 45 V. A. C., approximately. The optimum torque when loaded with 10″ reel in "normal play" is set at 210-220 grams, with a feed voltage ranging from 85 to 95 V. A. C., while in "reverse play" the torque is set at 70-80 grams with a feed voltage ranging from 55 to 65 V. A. C.

The torque can be adjusted by controlling the resistor R814 (50 Ω) as shown in Fig. 20. Since this resistor is adapted for varying the voltage fed midway between the take-up motor and the supply motor, increasing the value of the resistor increases the torque of the supply motor and conversely reduces the torque of the take-up motor. With this in mind, adjustment of the torque should be made with use of a wow meter so as to set the torque to a level where wow and flutter are held to a minimum.

FIG. 20



For adjustment, loosen the screw and move the strap as required

3. ADJUSTMENT OF SUPPLY MOTOR

The supply motor is, like the take-up motor, a condenser (3 μF) start 4-pole induction motor.

a) Its optimum torque when loaded with the 7″ reel in "normal play" is set between 40 and 50 grams (as measured by a bar gauge with tape wound on 5″ reel to a roll diameter of 60 mm). The voltage fed to the supply motor is in the range between 40 and 45 V. A. C.

The torque in "reverse play" is optimum in the range of 130 to 145 grams with the feed voltage between 75 and 80 V. A. C.

b) The torque optimum for the loading of 10″ reel in "normal play" is in the range from 70 to 80 grams (with the feed voltage ranging from 55 to 65 V.A.C.), while in the "reverse play" the optimum torque is in the range between 230 and 235 grams (with the feed voltage ranging from 85 to 95 V. A. C.).

The optimum torque is adjusted in the same manner as in the case of the take-up motor.

4. ADJUSTMENT OF HEADS

Adjustment of heads requires high-precision workmanship and for this reason re-adjustment of the heads, after delivery of tape-recorders, should be avoided without attention of the skilled engineer. In case, however, the head requires replacement, this should be done in accordance with the following procedures.

(A) Mounting and positioning of heads (See Fig. 21)

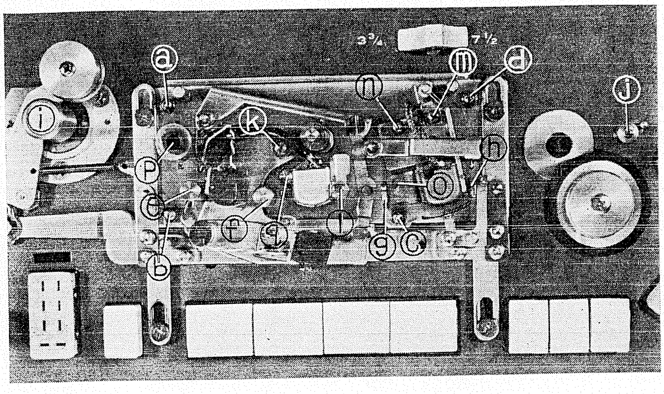
i) Fix the head while loosening the control nuts ⓐ, ⓑ, ⓒ and ⓓ, and set the tape in motion for "normal play".

ii) Adjust the position of the tape, using the inclination control nuts ⓐ through ⓓ so that the tape passes the centers of the tape guides ⓔ,ⓕ,ⓖ and ⓗ, respectively.

iii) Now, set the machine in the "reverse play" mode of operation. Use the inclination control nuts ⓐ through ⓓ and also the level regulating screw ⓘ and adjust the position of the tape contacting the periphery of the impedance roller ⓘ so that the tape will assume the same position as in "normal play".

iv) To be sure that the adjustments have been properly accomplished, check the heads once again with respect to ii) and iii).
(Note that incomplete adjustment may lead to sluggish displacement of the cross-field bias head.)

FIG. 21



(B) Adjustment of head level

* In "normal play" mode

a) Adjust the erase head so as to be positioned about 0.15 mm above the upper edge of the tape by turning the level control screw ⓚ.

b) Adjust the position of the record head by turning the level control screw ⓛ so that the upper edge of the tape is aligned with the top edge of the CH-1 core.

c) Adjust the position of the playback head with the level control screw ⓜ so that the upper edge of the tape is brought into register with the top edge of the CH-1 core, in just the same manner as in the adjustment of the record head.

* In "reverse play" mode

a) Adjust the playback head by turning the level control screw ⓝ so that the lower edge of the tape is located at the same level with the botton edge of the CH-2 core.

* Note: Check the tape to head contact alignment both in horizointal and vertical directions.

(C) Adjustment of playback head alignment

Playback an Ampex Alignment tape (8000 c/s) at the tape speed of 3-3/4″ in "normal play" mode. Set the head at a point at which maximum output is obtained by turning the alignment control screw ⓞ.

Apply this test in "reverse play" also and see if the differences of output levels between the two modes of tape operation are in excess of 1 dB. If so, this should be reduced to less than 1 dB by turning the alignment control screw ⓞ.

(D) Adjustment of recording bias voltage

Set the machine in "record" mode of operation. Set VTVM between the lead wire (red in colour) of the bias voltage control coil ⓟ and ground. Adjust the terminal voltages to read 40 V. A. C. by vertically moving the control screw in the coil ⓟ.

(Preferably, a driver of non-conductive nature, for example, a driver mode of a plastic material, should be used for this purpose. An ordinary metal driver, upon insertion into the coil ⓟ, alters the value of μ, resulting in correct bias voltage readings.)

(E) Adjustment of record head alignment

Set a blank tape in motion at the tape speed of 7-1/2″. Record 10,000 c/s sine waves at about -10 VU. Adjust the record angle control screw ⓠ to obtain maximum reproduce output.

* After the foregoing adjustments, the amplifiers should also be adjusted in accordance with the section of "Amplifire Adjustment" (except for the main amplifier).

5. ADJUSTMENT OF BRAKE

In order to protect the tape from being damaged when the machine comes to a "STOP", the voltages fed to both the supply motor and the take-up motor are cut off from the relays, and each brake felt is simultaneously pressed against each motor pulley to stop the rotation of the motors. Adjust the brake, by turning the brake regulating screws ⓐ and ⓑ while the machine is in its "STOP" mode as shown in Fig. 22, so that slipping tension between the left and the right motor pulleys and the brake felt is maintained between 200 and 250 grams. (Read the value with a bar gauge, using a tape wound on 5″ reels to a roll diameter of 60 mm.)

FIG. 22

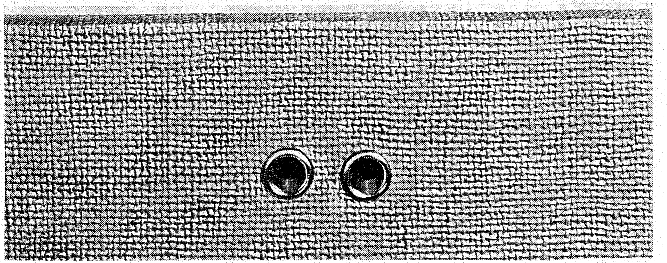
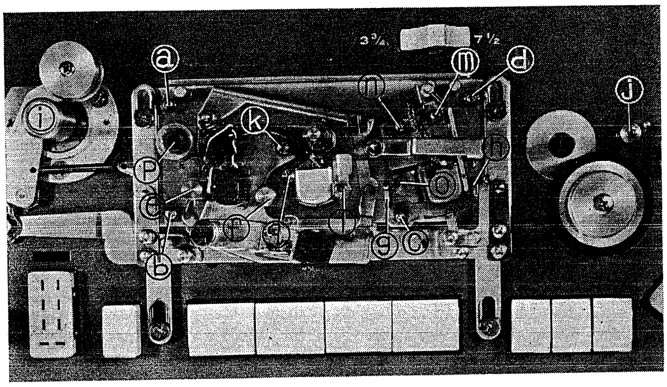


FIG. 21



(B) Adjustment of head level

* In "normal play" mode

a) Adjust the erase head so as to be positioned about 0.15 mm above the upper edge of the tape by turning the level control screw ⓚ.

b) Adjust the position of the record head by turning the level control screw ⓛ so that the upper edge of the tape is aligned with the top edge of the CH-1 core.

c) Adjust the position of the playback head with the level control screw ⓜ so that the upper edge of the tape is brought into register with the top edge of the CH-1 core, in just the same manner as in the adjustment of the record head.

* In "reverse play" mode

a) Adjust the playback head by turning the level control screw ⓝ so that the lower edge of the tape is located at the same level with the botton edge of the CH-2 core.

* Note: Check the tape to head contact alignment both in horizointal and vertical directions.

(C) Adjustment of playback head alignment

Playback an Ampex Alignment tape (8000 c/s) at the tape speed of 3-3/4″ in "normal play" mode. Set the head at a point at which maximum output is obtained by turning the alignment control screw ⓞ.

Apply this test in "reverse play" also and see if the differences of output levels between the two modes of tape operation are in excess of 1 dB. If so, this should be reduced to less than 1 dB by turning the alignment control screw ⓞ.

(D) Adjustment of recording bias voltage

Set the machine in "record" mode of operation. Set VTVM between the lead wire (red in colour) of the bias voltage control coil ⓟ and ground. Adjust the terminal voltages to read 40 V.A.C. by vertically moving the control screw in the coil ⓟ.

(Preferably, a driver of non-conductive nature, for example, a driver mode of a plastic material, should be used for this purpose. An ordinary metal driver, upon insertion into the coil ⓟ, alters the value of μ, resulting in correct bias voltage readings.)

(E) Adjustment of record head alignment

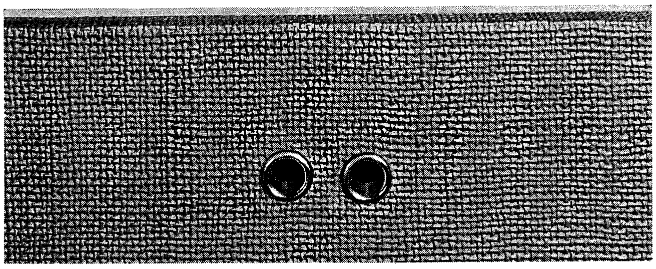
Set a blank tape in motion at the tape speed of 7-1/2″. Record 10,000 c/s sine waves at about -10 VU. Adjust the record angle control screw ⓠ to obtain maximum reproduce output.

* After the foregoing adjustments, the amplifiers should also be adjusted in accordance with the section of "Amplifire Adjustment" (except for the main amplifier).

5. ADJUSTMENT OF BRAKE

In order to protect the tape from being damaged when the machine comes to a "STOP", the voltages fed to both the supply motor and the take-up motor are cut off from the relays, and each brake felt is simultaneously pressed against each motor pulley to stop the rotation of the motors. Adjust the brake, by turning the brake regulating screws ⓐ and ⓑ while the machine is in its "STOP" mode as shown in Fig. 22, so that slipping tension between the left and the right motor pulleys and the brake felt is maintained between 200 and 250 grams. (Read the value with a bar gauge, using a tape wound on 5″ reels to a roll diameter of 60 mm.)

FIG. 22

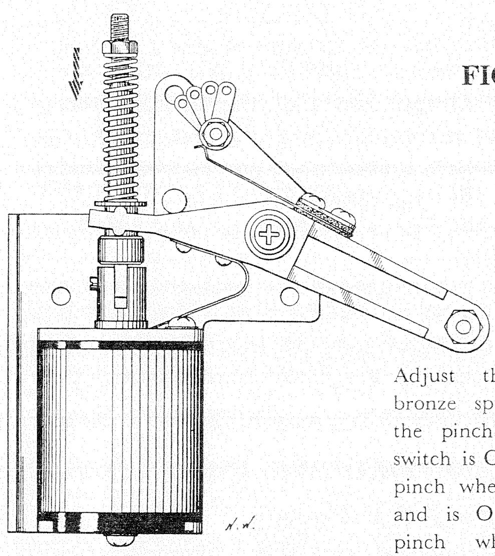


6. ADJUSTMENT OF PINCH WHEEL MUTE SWITCH

The switch is gang-operated with the pinch wheel for constructing a voice circuit only under PLAY conditions. Accordingly, improper adjustment of the switch contacts may result in reproduction failure or troublesome noise during fast rewind.

Adjust the switch contact position so that the contact is OFF when the pinch wheel is in contact with the capstan, and ON when the pinch wheel is not operated.

FIG. 23

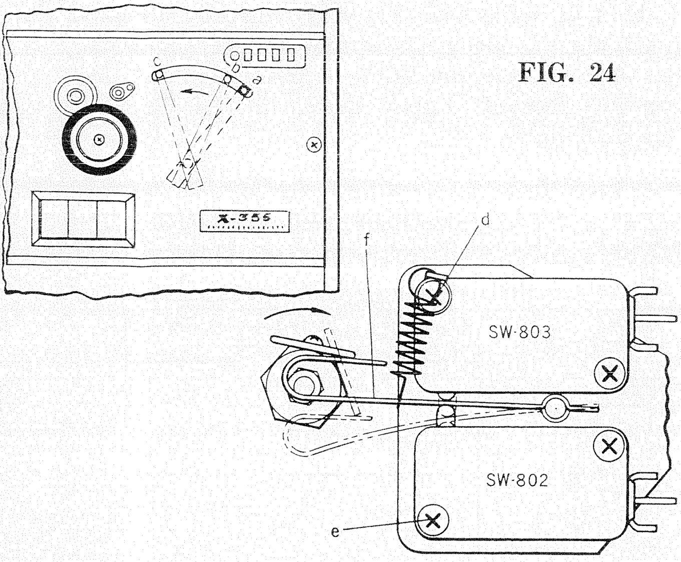


Adjust this phosphor bronze spring so that the pinch wheel mute switch is OFF when the pinch wheel is operated and is ON when the pinch wheel is not operated.

7. ADJUSTMENT OF TENSION SWITCH

This tension switch is operative interlockingly with the tension arm in such fashion that only when the arm is located between ⓑ and ⓒ as shown in Fig. 24, the switches SW-802 and SW-803 are tripped into "ON" position thereby actuating the relays. Therefore, loosen the fastening screws ⓓ and ⓔ of the switches (SW-802 and SW-803) and displace them with fingers to adjust them so that only when the tension arm is located between ⓑ and ⓒ, the lever ⓕ will press the button SW-802 and conversely, the button SW-903 will emerge.

FIG. 24

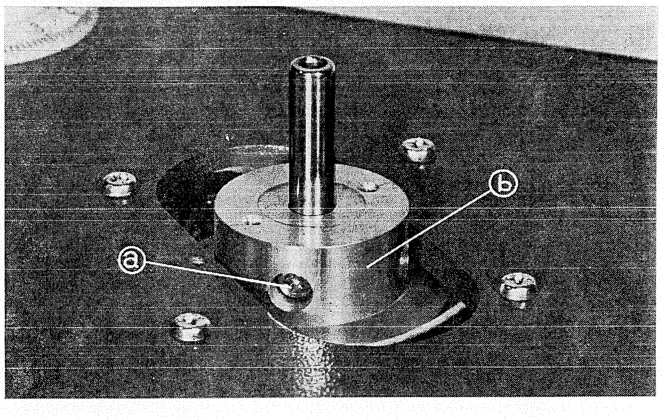


8. ADJUSTMENT OF REEL BASE HEIGHT

When the reel base height is improper, the tape rubs against the reel causing tape wear on one edge or even broken tape.

Loosen the height adjustment screws (a)···(two used) of the motor pulley and align the reel center with the tape center by moving the motor pulley (b) manually. Tighten the adjustment screws. (See Fig. 25.)

FIG. 25

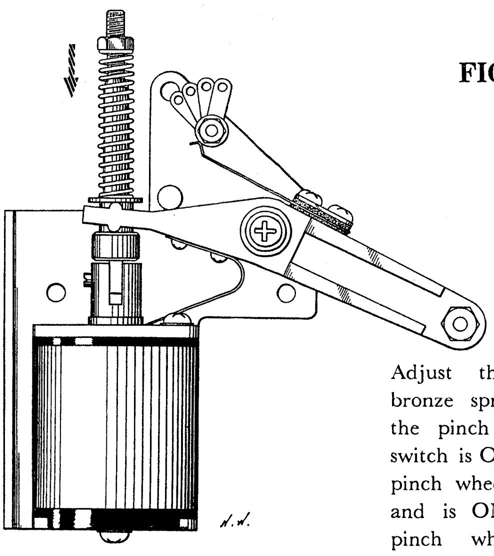


6. ADJUSTMENT OF PINCH WHEEL MUTE SWITCH

The switch is gang-operated with the pinch wheel for constructing a voice circuit only under PLAY conditions. Accordingly, improper adjustment of the switch contacts may result in reproduction failure or troublesome noise during fast rewind.

Adjust the switch contact position so that the contact is OFF when the pinch wheel is in contact with the capstan. and ON when the pinch wheel is not operated.

FIG. 23

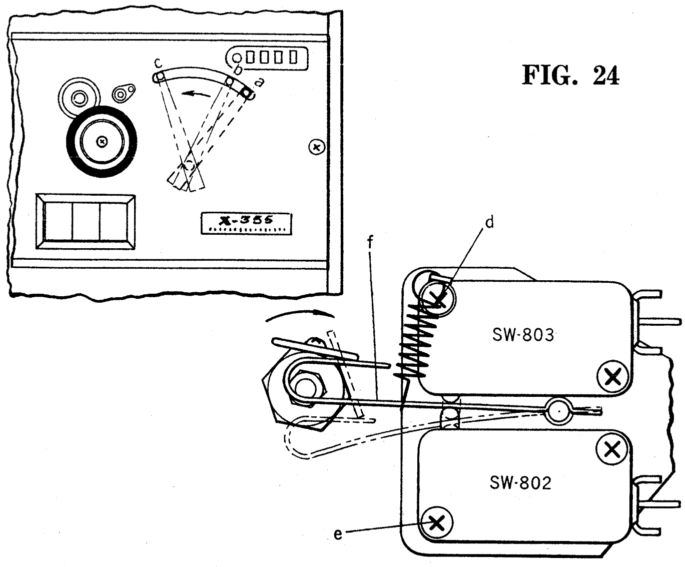


Adjust this phosphor bronze spring so that the pinch wheel mute switch is OFF when the pinch wheel is operated and is ON when the pinch wheel is not operated.

7. ADJUSTMENT OF TENSION SWITCH

This tension switch is operative interlockingly with the tension arm in such fashion that only when the arm is located between ⓑ and ⓒ as shown in Fig. 24, the switches SW-802 and SW-803 are tripped into "ON" position thereby actuating the relays. Therefore, loosen the fastening screws ⓓ and ⓔ of the switches (SW-802 and SW-803) and displace them with fingers to adjust them so that only when the tension arm is located between ⓑ and ⓒ, the lever ⓕ will press the button SW-802 and conversely, the button SW-903 will emerge.

FIG. 24

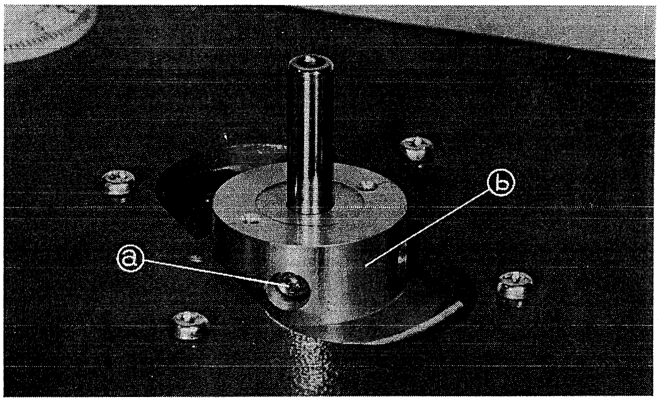


8. ADJUSTMENT OF REEL BASE HEIGHT

When the reel base height is improper, the tape rubs against the reel causing tape wear on one edge or even broken tape.

Loosen the height adjustment screws (a)···(two used) of the motor pulley and align the reel center with the tape center by moving the motor pulley (b) manually. Tighten the adjustment screws. (See Fig. 25.)

FIG. 25



VII. AMPLIFIER ADJUSTMENT

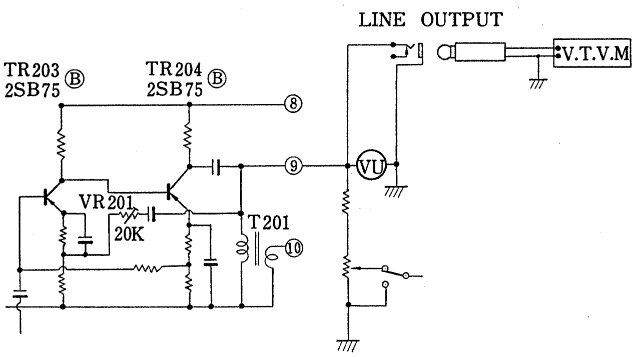
1) ADJUSTMENT OF PLAYBACK OUTPUT LEVEL (PRE-AMPLIFIER)

a) Connect VTVM (use one with Milli-Volt scale) to line output as shown in Fig. 26.

b) Playback an Ampex 250 c/s test tape (7.5″/s). Adjust VR201 (semi-fixed resistor, 20 k Ω) so that the Line Output Level of Channel 2 indicates 1. 228 V. At this point, the VU meter should indicate 0 VU ± 0.5 VU.

c) Then, adjust the Line Output Level of Channel 1 in the same manner as followed in the adjustment of the level of CH-2. This adjustment should be done, however, while pushing the playback head downwards by about 0.5 mm with fingers after setting the Head Selector either to the 3-2 monaural position or to the stereo position. Compare both Line Output Levels after adjustment. By reading the 355 VU meter, the level of CH-1 will be about 0.5 to 1 dB lower than that of CH-2.

FIG. 26



2) ADJUSTMENT OF RECORDING EQUALIZATION CHARACTERISTICS

a) Set a testing blank tape (SCOTCH-111) on the machine.

b) Set Equalizer Switch in the 7-1/2″ position.

c) Supply 1,000 c/s sine wave of the Audio Frequency Oscillator to the Line Input of the X-355 through the Attenuator (ATT).

d) Set the X-355 in "record" mode. Set the tape into motion at the tape speed of 7-1/2″, and set the Playback Output Button in "IN" position (thereby placing the machine in the playback monitoring for recording).

e) Operate the Line Volume and the ATT to adjust the input level so that the level of the Line Output reads about 200 mV (−16 dB).

f) After this adjustment, shift the signal frequency of Audio Frequency Oscillator to 10,000 c/s. Operate the resistor VR-102 (500 Ω (B) semi-fixed resistor) to adjust the Line Output Level of X-355 so as to assume the same value as that in 1,000 c/s (approximately 200 mV).

"Check":

In the (f) state, shift the signal frequency of Audio Frequency Oscillator to 18,000 c/s, and it will be noted that the Line Output Level of the X-355 is set at −6 dB or lower, as compared with the level at 1,000 c/s. Furthermore, when Equalizer Switch has been shifted to 3-3/4″ with the tape running at the speed of 3-3/4″, the Line Output Levels for 1,000 c/s and 10,000 c/s will be equal.

In the event that the equalization characteristics should deviate from the above standards after proper adjustments, such deviation may be due to mal-adjusted heads, and hence the heads should be readjusted according to the instructions on the Adjustment of Heads.

3) ADJUSTMENT OF RECORDING INPUT LEVEL

a) Connect VTVM to Line Output.

b) Supply 1,000 c/s sine wave of Audio Frequency Oscillator to the Line Input of the X-355.

c) Set a testing blank tape (SCOTCH-111) on the machine. Set the X-355 in "record" mode, and set the tape in motion at the speed of 7-1/2″.

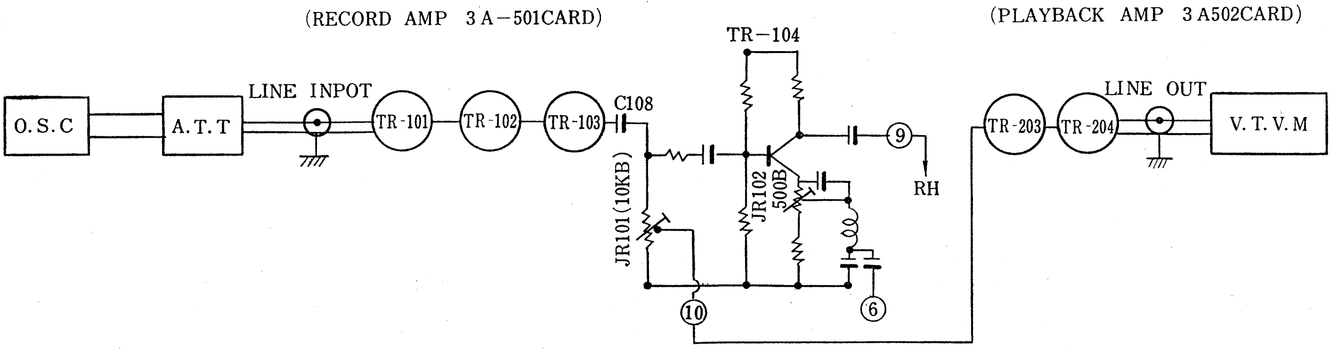
d) Set the Playback Output Button in "IN" position.

e) Manipulate the Line Volume (10 k Ω A) to adjust the Recording Input Level so that the indicator voltage of VTVM connected to Line Output reads 1. 228 V.

f) In the state of (e), re-set the Playback Output Button. Then, set the Record Output Button in "IN" position and operate VR-101 (10 kΩ B) so that the indicator of the VU meter of the X-355 will point at the volume unit of "0".

* If this later adjustment has been correctly accomplished, the VU meter should indicate the same value also when the operation of the output button is shifted from the Record Output Button to the Playback Output Button.

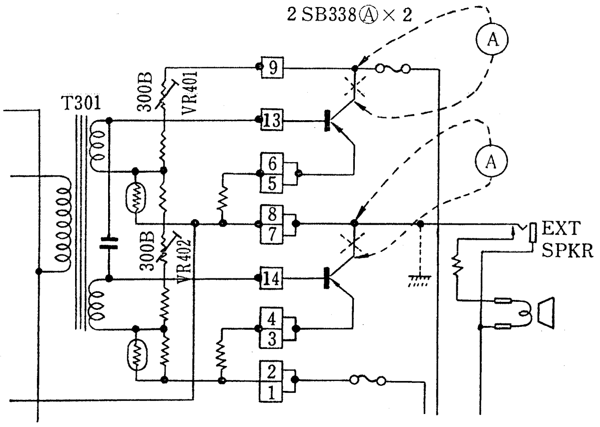
FIG. 27



4) ADJUSTMENT OF D. C. BIAS FOR POWER TRANSISTORS 〔2SB338 (A)〕

Set the ammeter as shown in Fig. 28. Operate VR-401 and VR-402 so that the amperage at absence of signal will be 50 mA.

FIG. 28

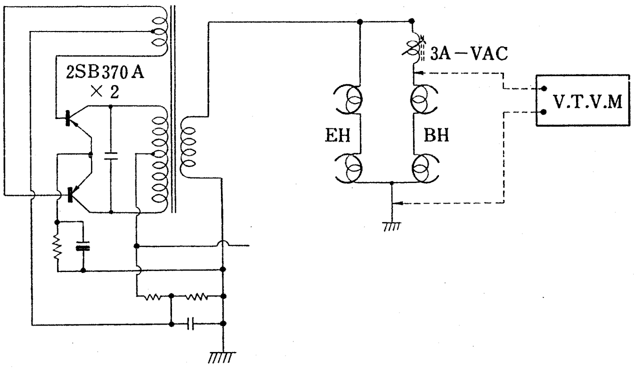


(Adjustment will be facilitated by the insertion of a short-circuited plug into the External Speaker Jack.)

5) ADJUSTMENT OF RECORDING BIAS VOLTAGE

This has been already described under the paragraph entitled, "Adjustment of Heads". Note that VTVM is set as shown in Fig. 29, and XL (reactance) of the Recording Bias Control Coil 3A-VAC is adjusted to accomplish this purpose.

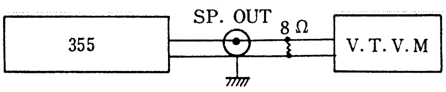
FIG. 29



6) S/N ADJUSTMENT

Playback a standard 250 cps (or 1,000 cps) sine wave tape recorded on a standard tape recorder (the tone switch should be set in the Flat Position). Connect VTVM (mV scale type) with 8 Ω resistor to the Speaker Output Jack and adjust the loudness volume until the VTVM indicates "0" dB. Then, remove the standard tape. Measure noise level under the same conditions and adjust by bending the shield metal located opposite to the playback head to read a lower noise point on the meter.

FIG. 30



VIII. MAINTENANCE

All moving parts have been lubricated before packing. After every 1500~2000 hours operation, lubrication is required for the following items. The grade of oil chosen should be good quality sewing machine oil.

The autodial gear portions should be lubricated with a small amount of high quality grease.

The surfaces of the erase, record, bias and playback heads, the tape guide roller, the capstan and the pinch wheel often become contaminated.

These surfaces should be cleaned from time to time with a soft cloth (gauze, etc.) dipped in alcohol or chlorothenenil.

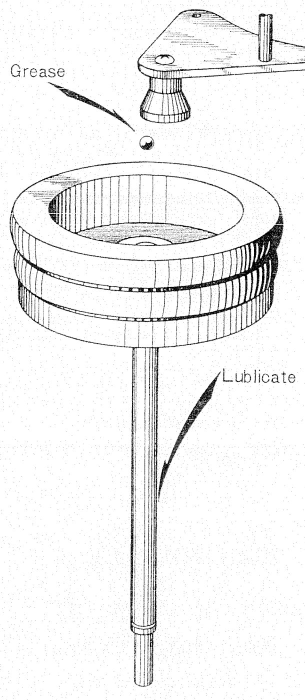
Extreme care should be taken in order not to allow the adherence of oil or grease on the drive belt, as this may cause slipping. Should oil or grease stick to the drive belt, clean with a soft cloth soaked in a cleaning solvent such as alcohol. In this case, other items in contact with the belt must also be cleaned.

For lubrication, refer to Fig. 31.

LUBRICATION POINTS

Main motor	replace two bearings
Left and right motors	replace a bearing
Capstan shaft	2 drops
Impedance roller shaft	2 drops
Pinch wheel shaft	2 drops
Selector	1 drop

FLYWHEEL



IMPEDANCE ROLLER

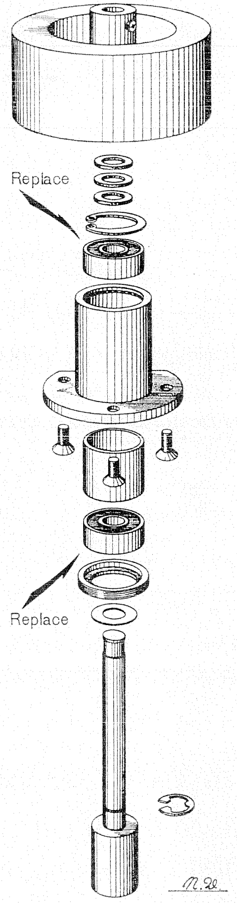
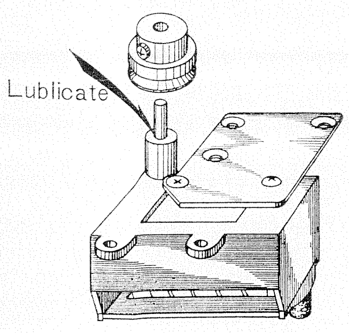
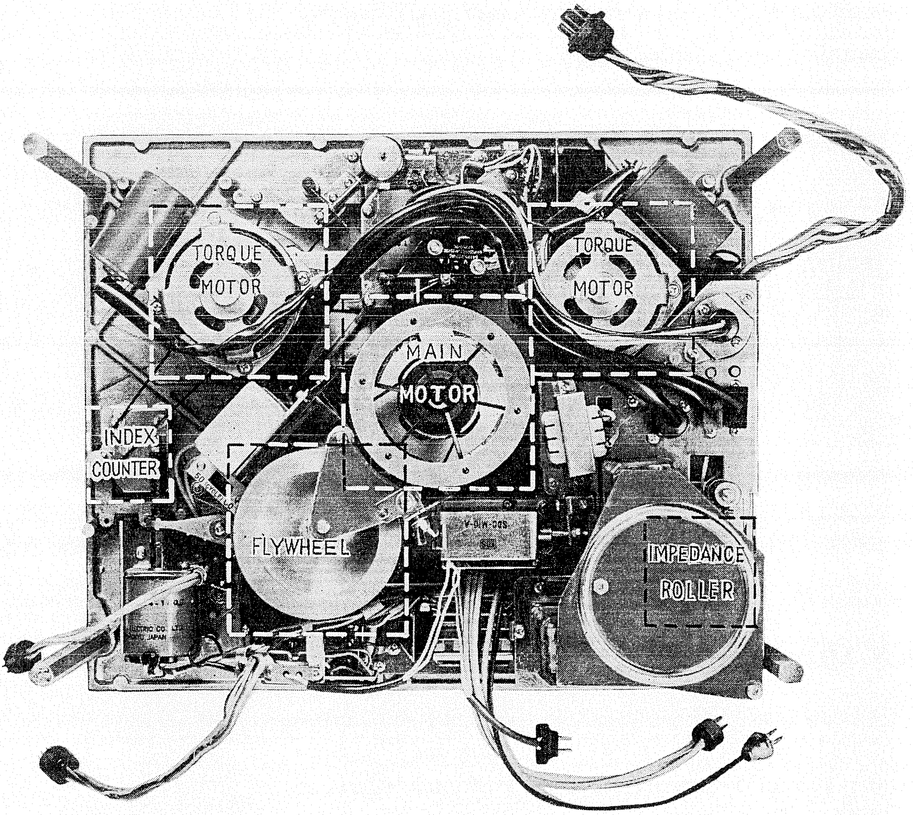


FIG. 31

INDEX COUNTER





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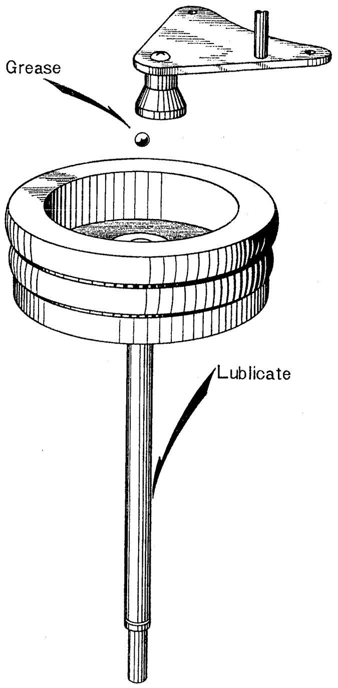


IMPEDANCE ROLLER

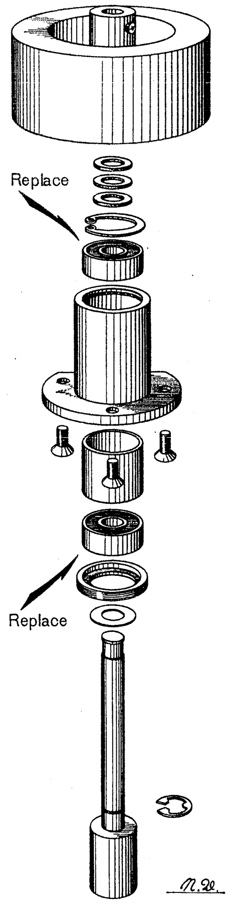
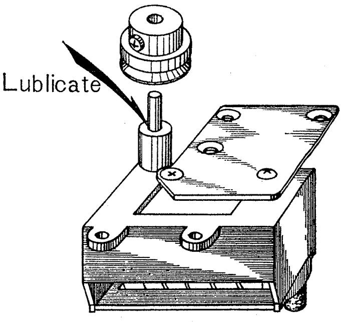
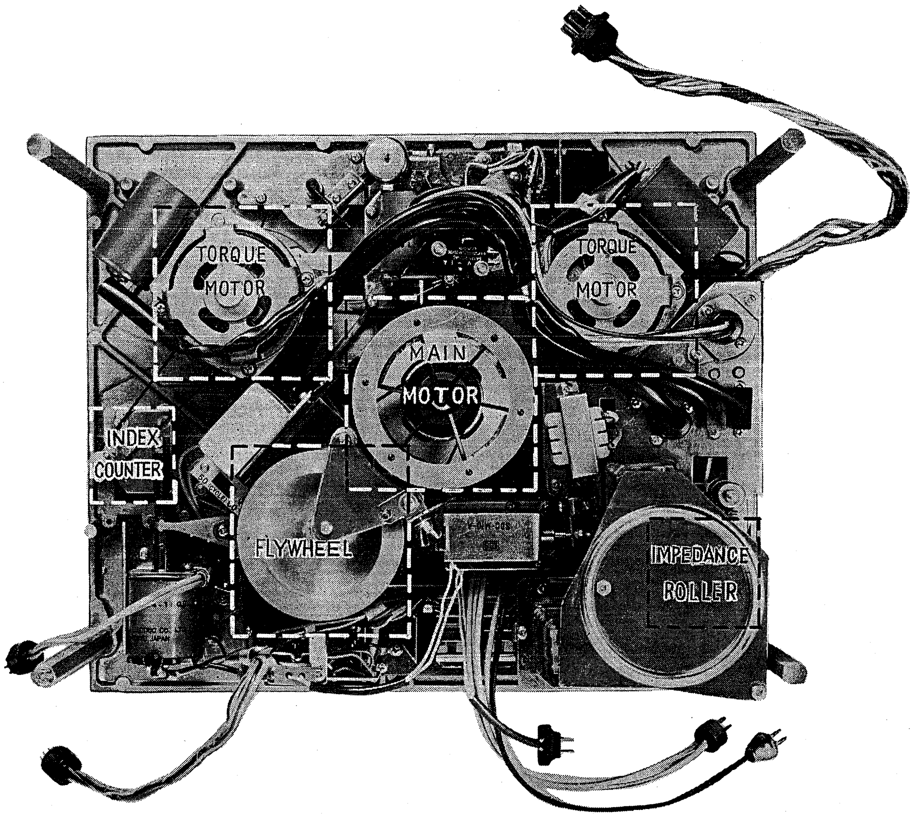


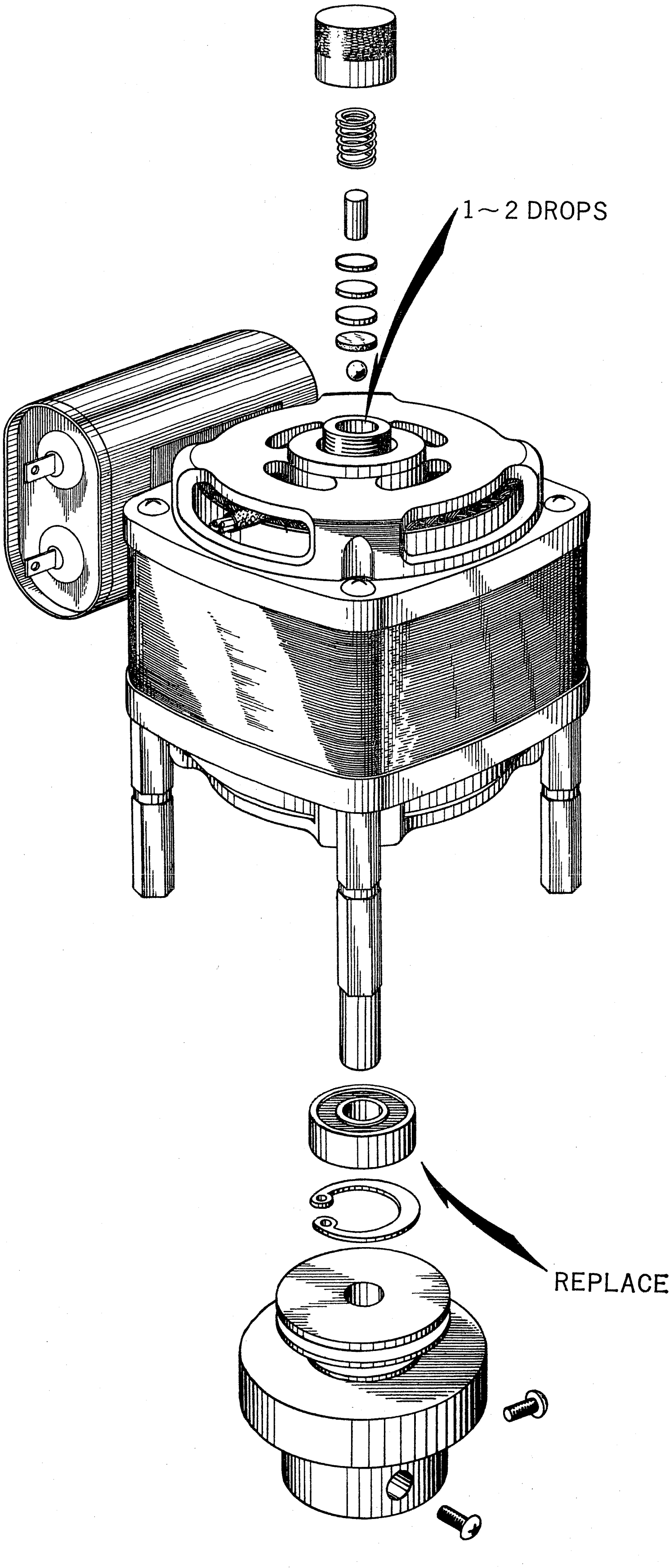
FIG. 31

INDEX COUNTER

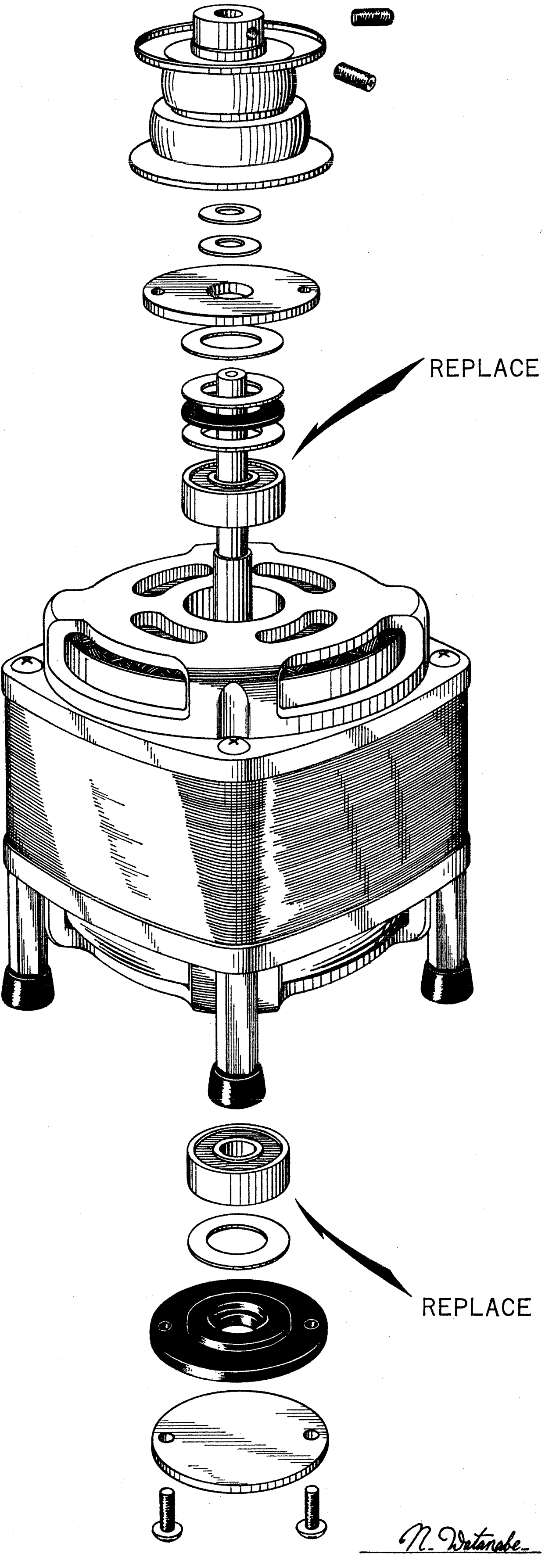




TORQUE MOTOR


1～2 DROPS
REPLACE

MAIN MOTOR


REPLACE
REPLACE

N. Watanabe

IX. REPLACEMENT PARTS TABLE

MECHANISM

MAIN MOTOR BLOCK

Parts No.	Nomenclature
01-001	Main Motor Comp.
002	Motor Chassis, Main Motor
003a	Motor Pulley
003b	Screw, without Head
004a	Motor Fan
004b	Ring, Motor Fan
004c	Screw
005	External Shield Plate, Motor
006a	Flywheel Comp.
006b	4 mm Ball Bearing
006c	Thrust Metal
007	Main Metal Case
008	Plate, Main Shaft
009	Prop A, Flywheel
010a	Plate, Flywheel
010b	Belt Change Lever
010c	Screw
010d	Prop, Belt Change Lever
010e	Screw
011	Drive Belt
012a	Speed Change Lever Comp.
012b	Spring F, Lever
012c	Screw
013	18P Slide Switch (FS-601N)
014a	6P Slide Switch, Cycle Change (FS-201NB)
014b	Name Plate, Cycle Change
014c	Screw
014d	Washer
015	MP Condenser
016	Resistor 1/4P 10K ohms
017	2P Plug
018	4P Plug (T Type)

WIND MOTOR BLOCK

Parts No.	Nomenclature
02-001	Wind Motor Comp.
002	Rewind Motor Comp.
003	2P Plug
004	MP Condenser 4μ 300 VAC
005	Supply Pulley
006	Take-up Pulley

HEAD BLOCK

Parts No.	Nomenclature
03-001	Head Assembly Comp.
03-002	Erase Head Comp.
002a	Shift Table, Erase Head
002b	Metal, Up-Down Table
002c	μ Spring
002d	Plate, Erase Head
002e	Pin, Cam
003	Recording Head Comp.
003a	LP Angle Table
003b	LP Table
003c	Height Adjusting Plate A, Recording Head
003d	Height Adjusting Plate B, Recording Head
003e	Angle Screw, Recording Head
003f	Screw, Up-Down Recording Head
004	Bias Head Comp.
004a	Shift Table, Bias Head
004b	Metal, Field Table
004c	Side Plate, Bias Head
004d	Lever, Bias Head
004e	Connecting Plate
004f	(-) Screw 2.3 × 4.5
005	Playback Head
005a	Shift Table, Playback Head
005b	Shaft, Up-Down Playback Head
005c	Reverse Spring
005d	3 mm closed Nut
005e	Angle Table, Playback Head
005f	Shift Metal, Playback Head
005g	Angle Screw, Playback Head
005h	Height Adjusting Plate, Playback Head
005i	Angle Adjusting Spring
005j	Up-Down Lever, Playback Head
005k	Spring, Head Plunger
005l	3 mm Nut
005m	Prop, Playback Head Shift
005n	Spring, Playback Head Shift
006a	Table, Head
006b	Stopper
007a	4T Tape Guide, B
007b	Tape Guide, A
007c	Micron Guide, A
007d	Micron Guide, B
008	Hum Bucking Coil
009	Tape Guide Comp.
009a	Screw
009b	Z Guide, A
009c	Washer A, Tape Guide
009d	Washer B, Tape Guide
009e	Bearing
009f	Z Guide, B
009g	Z Arm
009h	Spring, Z
009i	Z Lever, A
009j	Z Metal
010	Slider Lever, E
011a	Slider Lever, D
011b	Stop Spring, B
012	Screw, Amplifier Lever
013	Slider Lever
03-014a	Shifter Lever, C
014b	Shifter Pin
015	Shield Plate, Head
016	Switch Table
017	4T Cam
018	Shaft, Head Wheel
019	Head Gear, C
020	Head Gear, A
021	Shield Plate, H Switch
022	Rotary Switch
023	Shield Plate
024	Plunger A (SDC-M10A) Comp.
024a	Plunger A
024b	Shift Joint, Playback Head
025	Plunger B (SDC-M10B) Comp.
025a	Plunger B
025b	P Joint, Bias Head
026a	Pull Shaft, Bias Head
026b	Pull Metal, B
026c	Pull Lever
026d	Spring, DA
027	2P Plug
028	4P Plug
029	4P Plug (T Type)

HEAD COVER BLOCK

Parts No.	Nomenclature
04-001	Head Wheel
002	3A Cover, A
003a	3A Cover, B
003b	Screw 4 × 12

PUSH BUTTON BLOCK

Parts No.	Nomenclature
05-001	Main Push Button
002	Spring, Mechanism Push Button
003	Guide, Push Button
004	Prop, Push Button
005a	Chassis, Switch
005b	Rubber Bush
006a	Micro Switch
006b	Plate A, Micro Switch
006c	Plate B, Micro Switch
006d	Collar, Micro Switch
006e	Shaft, Micro Switch
006f	Washer Pin
007	Push Button, Power Switch
008	Power Switch

Parts No.	Nomenclature
05–009	Push Button, Automatic Switch
010	3AF Block Comp.
010a	3AF Print plate
010b	Auto. Chassis
010c	2P Socket (B Type)
010d	Tip Jack
010e	Tip Plug
010f	8P Plug
011	8P Johnson Socket, for Remote Control Comp.
012	Silcon Diode SW-05a

RELAY BLOCK

06–001	Relay Printed Plate Block Comp.
002	Relay Printed Plate
002a	22 Multi Jack
002b	11P Socket (O Type)
002c	2P Socket (B Type)
002d	4P Socket (B Type)
003a	MP Condenser 0.5μ 350 VDC (220 VAC)
003b	MP Condenser 0.1μ 350 VDC (220 VAC)
003c	MP Condenser 0.5μ 150 VDC
003d	MP Condenser 0.1μ 150 VDC
003e	Oil Condenser 0.02μ 400 VDC
003f	Electrolytic Condenser 50μ 50V
003g	Wired Resistor 5L 8 ohms J
003h	Resistor 1P 100 ohms J
003i	Resistor 1/4P 50 ohms K
004	Lug Type Condenser 2500μ 40V
005	9P Plug
006	P Printed Plate Chassis Comp.
006a	Table, P Socket
006b	Choke Transformer, Reverse Plunger (0.3H 0.1A)
006c	Base, P Chassis
007	Resistor 50 ohms 10H
008a	55 Prop.
008b	55 Prop. (Hexagonal)
009	69 Prop.
010	Side Plate, P Chassis
011	Relay Switch DC 24V
012	Relay Support Plate, B
013	Print Plug
014	6P Plug

BRAKE BLOCK

07–001	Brake Relay Table Comp.
002	Brake Connect Plate Comp.
003a	Brake Band
003b	Switch Angle, A
003c	Switch Angle, B
07–004a	Spring, Brake
004b	Spring Holder, A
004c	Spring Holder, B
005a	Brake Adjusting Screw
005b	Brake Adjusting Spring
006a	Brake Lever Comp.
006b	Shaft, Brake Lever
007a	Brake Plunger
007b	Relay York
007c	Connecting Screw
007d	Table, Micro Switch
007e	Micro Switch
008	4P Plug (T Type)
009	Tip Connector Jack

REPEATER BLOCK

08–001a	Dial Button
001b	Spring, Repeater Knob
001c	Repeater Knob, B
001d	Repeater Dial
001e	Spring, Clamp
001f	Spur Gear
001g	Dial Stop Plate
001h	Repeater Switch
001i	Switch Angle, A
002a	Repeater Change Knob
002b	Escutcheon, Repeater Change Knob
002c	Change Lever
002d	Angle, Change Lever
002e	Shaft
003	Timer Chassis Comp.
004a	Insulator Spacer
004b	Insulator Table, Switch
004c	Switch Plate, B
005a	Repeater Gear
005b	Washer
005c	Pressure Spring
005d	Clank Gear
005e	Screw, without Head
006a	Metal Fitting, Shaft
006b	Repeater Gear
006c	Spur Gear
007a	Repeater Worm with Shaft
007b	Washer
007c	Timer Pulley
007d	Timer Belt
008a	Angle, UZ Socket
008b	UZ Socket
008c	Condenser Q-AK1
008d	Tip Connector Jack

TENSION ARM BLOCK

09–001	Tension Arm Comp.
001a	Guide Pin, Tension Arm
001b	Metal, Tension Lever
001c	Nut, Tension Lever
001d	Cushion, Tension Arm
004a	Lever, Micro Switch
09–004b	Spring, Micro Switch
005	Micro Switch
006	Table, Cut-off Micro Switch

IMPEDANCE BLOCK

10–001	Z Roller
002	Screw, Z Bearing
003	Bearing 608VUC2E
004	Z Case
005	Bearing Collar
006	Pin
007	Impedance Wheel

PINCH WHEEL BLOCK

11–001a	(+) Screw Flat Mould 4×12
001b	Cap, Pinch Wheel
001c	Pinch Wheel
001d	Shaft, Pinch Wheel
002	Base B, Pinch Wheel
003	Shaft, Pinch Wheel Arm
004a	Arm, Pinch Wheel
004b	Spring, Pinch Wheel
005	Relay Comp.
005a	Relay York
005b	Plunger
005c	Tip Connector Plug
006a	Pinch Wheel Pull Bar Comp.
006b	Washer
006c	Pressure Spring, Pinch Wheel
006d	Nut
006e	Stop Pin B, Pinch Wheel
007a	Short Switch B
007b	Prop B, Short Switch
007c	4P Plug

COUNTER BLOCK

12–001	Counter Four Digit Comp.
002	Plate, Counter
003a	Pulley, Counter
003b	Screw
004	Belt, Counter

POWER BLOCK

13–001	Power Chassis
002	Power Transformer
003	Auto. Transformer, Motor
004	Rectifier SPN–01

Parts No.	Nomenclature
13–005	Rectifier 12C–2
006	US Socket, TV–318
007	9P Mould Socket, Black
008a	6P Slide Switch ESS–22C–NB, Cycle Change
008b	Name Plate, Cycle Change
009	3P Lug Plate
010	2P Lug Plate
011a	Lug Type Condenser 500µ 50V
011b	Tubular Type Condenser 500µ 50V
012a	Wired Resistor 1.5L 0.2 ohms K
012b	Wired Resistor 2L 120 ohms K
012c	Wired Resistor 2L 100 ohms K
012d	Wired Resistor 5L 105 ohms K
013	12 mm Rubber Bush
014	Power Connector Plate
015	Power Selector Knob
016	Power Change Socket
017	Hexangular Prop, Selector
018	6P Slide Switch ESS–22C–NC, Power Change
019	Prop, Switch
020	Hexangular Prop, Selector
021	Arm, Power Selector
022a	Plate, Power Selector
022b	3 mm Closed Nut
023	6P Slide Switch ESS-22C-NB, Reel Size
024	3A Fiber
025a	Fuse Post
025b	Fuse, 3A
026	Cord Support
027	AC Cord
028	Rubber Bush, AC Cord

PANEL BLOCK

14–001	Mechanism Panel
001a	(+) Screw Truss 4×4
001b	Washer
001c	Prop, Mechanism Panel
002	Mechanism Frame
002a	(+) Screw Truss 4×25
003a	Reel Holder
003b	Screw Flat 3×8
003c	Rubber, Reel Table
003d	Plate, Reel Table
003e	Spring, Reel Table

Parts No.	Nomenclature
14–003f	Screw
003g	Reel Table Ring
004	Speed Change Knob, B
005a	Screw, without Head
005b	R Guide
005c	Prop, R Guide
005d	Cover, R Pin
005e	R Pin
005f	Insulator Ring
006	Dust Cover, Capstan Shaft

CASE BLOCK

15–001	Case Comp.
001a	Case
002a	3A Ventilator
002b	(+) Screw Truss 3×6
003	Cord Holder
004	Sound Mirror
005a	Amplifier Base Panel, Case
005b	Catch, Amplifier Base Panel
006a	Rubber Foot
006b	(+) Screw Truss 4×20
007a	Escutcheon
007b	(+) Screw Truss 3×8
008	Speaker Russ Plate
009	Speaker 6DJ1
010	Russ Plate, A
011	Patent Name Plate
012	Support Angle, Case
013	Catch
014	Hinge

AMPLIFIER

AMPLIFIER CHASSIS BLOCK

16–001	Amplifier Chassis, A
002	Amplifiier Chassis, B
003	27 Prop
004a	Holder A, Muliti Jack
004b	10P Multi Jack
005a	Hoder B, Multi Jack
005b	18P Multi Jack
006a	Supporter, Printed Plate
006b	Holder, Printed Plate Supporter
007a	4P Jack
007b	Table, 4P Jack
008a	4P Socket
008b	Holder, 4P Socket

Parts No.	Nomenclature
16–009a	2-pole E Jack
009b	Name Plate, Jack
010	4P Connector Socket
011	US Plug
012	Tip, Speaker
013	Small Rubber
014	Speed Nut
015a	2P Fuse Holder
015b	Fuse, 1A
016a	3P Lug Plate, Small
016b	3P Lug Plate, 31 L1
016c	4P Lug Plate, 41 L2
016d	4P Lug Plate, 42 L1
016e	5P Lug Plate, Small
017	Transistor 2SB 338(A) or 2SB 471
018a	Tubular Type Electrolytic Condenser 500µ F 25V
018b	Tubular Type Electrolytic Condenser 200µ F 25V
018c	Tubular Type Electrolytic Condenser 1000µ F 25V
019a	Resistor 1/4P 47 ohms K
019b	Resistor 1/4P 220 ohms J
019c	Resistor 1/4P 820 ohms
019d	Resistor 1/4P 6.8K ohms K
019e	Resistor 1/4P 10K ohms K
019f	Resistor 1/4P 100K ohms
019g	Wired Resistor 3WL 8 ohms K

AMPLIFIER FRAME BLOCK

17–001	Amplifier Frame
002	Support Angle, Amplifier Frame
003a	Prop A, Amplifier Panel
003b	Prop B, Amplifier Panel
004a	Prop A, Switch
004b	Prop B, Switch
005	VU Meter (VH-30)
006	Spring, VU Meter
007a	Pilot Lamp, Swan Type
007b	Lamp Socket
008a	Recording Button
008b	Lever, Reeording Lock
009a	2-pole E Jack (MIC Input)
009b	Holder, Jack
010a	3-pole E Jack (Headphone Input)
010b	Holder, Jack
011a	Seasaw Switch (Function Switch, Tone Switch, Speaker ON/OFF Switch)
011b	Seasaw Switch (Equalizer Switch)

Parts No.	Nomenclature
17-012	Push Button Switch (Equalizer Switch)
013a	3P Lug Plate, Small
013b	5P Lug Plate, Small
014a	Variable Resistor, Duplex
014b	Variable Resistor
015a	Resistor 1/4P 10K ohms
015b	Resistor 1/4P 39K ohms
016	Tubular Type Oil Condenser 0.02 (M) 400WV

AMPLIFIER CARD BLOCK

RECORD CARD

18-001	Record Card Comp.
002	Printed Plate, Record Card
003	Holder, Record Card
004a	Transistor 2SB 443 (A)
004b	Transistor 2SB 75 (B)
005a	Tubular Type Electrolytic Condenser 30μ F 3V
005b	Tubular Type Electrolytic Condenser 100μ F 3V
005c	Tubular Type Electrolytic Condenser 100μ F 6V
005d	Tubular Type Electrolytic Condenser 10μ F 10V
005e	Tubular Type Electrolytic Condenser 100μ F 10V
005f	Tubular Type Electrolytic Condenser 10μ F 25V
005g	Mylar Condenser 0.033μ F 50V K
005h	Mylar Condenser 0.047μ F 50V K
005i	Mylar Condenser 0.1μ F 50V K
006a	Resistor 1/4P 100 ohms K
006b	Resistor 1/4P 220 ohms J
006c	Resistor 1/4P 300 ohms J
006d	Resistor 1/4P 560 ohms J
006e	Resistor 1/4P 1.2K ohms J
006f	Resistor 1/4P 1.5K ohms J
006g	Resistor 1/4P 3K ohms K
006h	Resistor 1/4P 3.3K ohms K
006i	Resistor 1/4P 10K ohms K
006j	Resistor 1/4P 10K ohms J
006k	Resistor 1/4P 15K ohms J
006l	Resistor 1/4P 22K ohms J
006m	Resistor 1/4P 100K ohms J
007a	Half Fixed Resistor 500 ohms (B)
007b	Half Fixed Resistor 10K ohms (B)
008	Peaking Coil 300μ H
009	Screw, (+) 2.3×5
010	2.3 mm Nut

PLAYBACK CARD

19-001	Playback Card Comp.
002	Printed Plate, Playback Card
003	Holder, Playback Card
004a	Transistor 2SB 443 (A)
004b	Transistor 2SB 75 (B)
004c	Transistor 2SB 75 (F)
005a	Tubular Type Electrolytic Condenser 30μ F 3V
005b	Tubular Type Electrolytic Condenser 100μ F 3V
005c	Tubular Type Electrolytic Condenser 100μ F 6V
19-005d	Tubular Type Electrolytic Condenser 10μ F 10V
005e	Tubular Type Electrolytic Condenser 100μ F 10V
005f	Tubular Type Electrolytic Condenser 10μ F 25V
005g	Tubular Type Electrolytic Condenser 50μ F 25V
005h	Mylar Condenser 0.01μ F 50V J
005i	Mylar Condenser 0.22μ F 35V K
006a	Resistor 1/4P 100 ohms K
006b	Resistor 1/4P 220 ohms J
006c	Resistor 1/4P 270 ohms J
006d	Resistor 1/4P 300 ohms J
006e	Resistor 1/4P 560 ohms J
006f	Resistor 1/4P 1.5K ohms J
006g	Resistor 1/4P 1.8K ohms K
006h	Resistor 1/4P 2.2K ohms K
006i	Resistor 1/4P 3K ohms K
006j	Resistor 1/4P 3.3K ohms K
006k	Resistor 1/4P 4.7K ohms J
006l	Resistor 1/4P 6.8K ohms K
006m	Resistor 1/4P 10K ohms K
006n	Resistor 1/4P 10K ohms J
006o	Resistor 1/4P 15K ohms J
006p	Resistor 1/4P 100K ohms J
007	Half Fixed Resistor 20K ohms (B)
008	Headphone Transformer 7K ohms: 8 ohms
009	Screw, (+) 2.3×5
010	2.3 mm Nut

RELAY CARD

20-001	Relay Card Comp.
002	Printed Plate A, Relay Card
003	Printed Plate B, Relay Card
004	Silicon Diode SE-05a
005	Tubular Type Electrolytic Condenser 200μ F 25V
006a	Resistor 1/4P 220 ohms J
006b	Resistor 1/4P 1K ohms K
007	Compound Body 120 ohms+0.1μ F 250V
008a	Relay FBV153b
008b	Socket
008c	Metal Holder
009	9P Socket, Printed Plate
010	Angle, Relay
011	Holder, Reloy Card
012	Screw, (+) 2.3×5
013	2.3 mm Nut

MAIN AMPLIFIER CARD

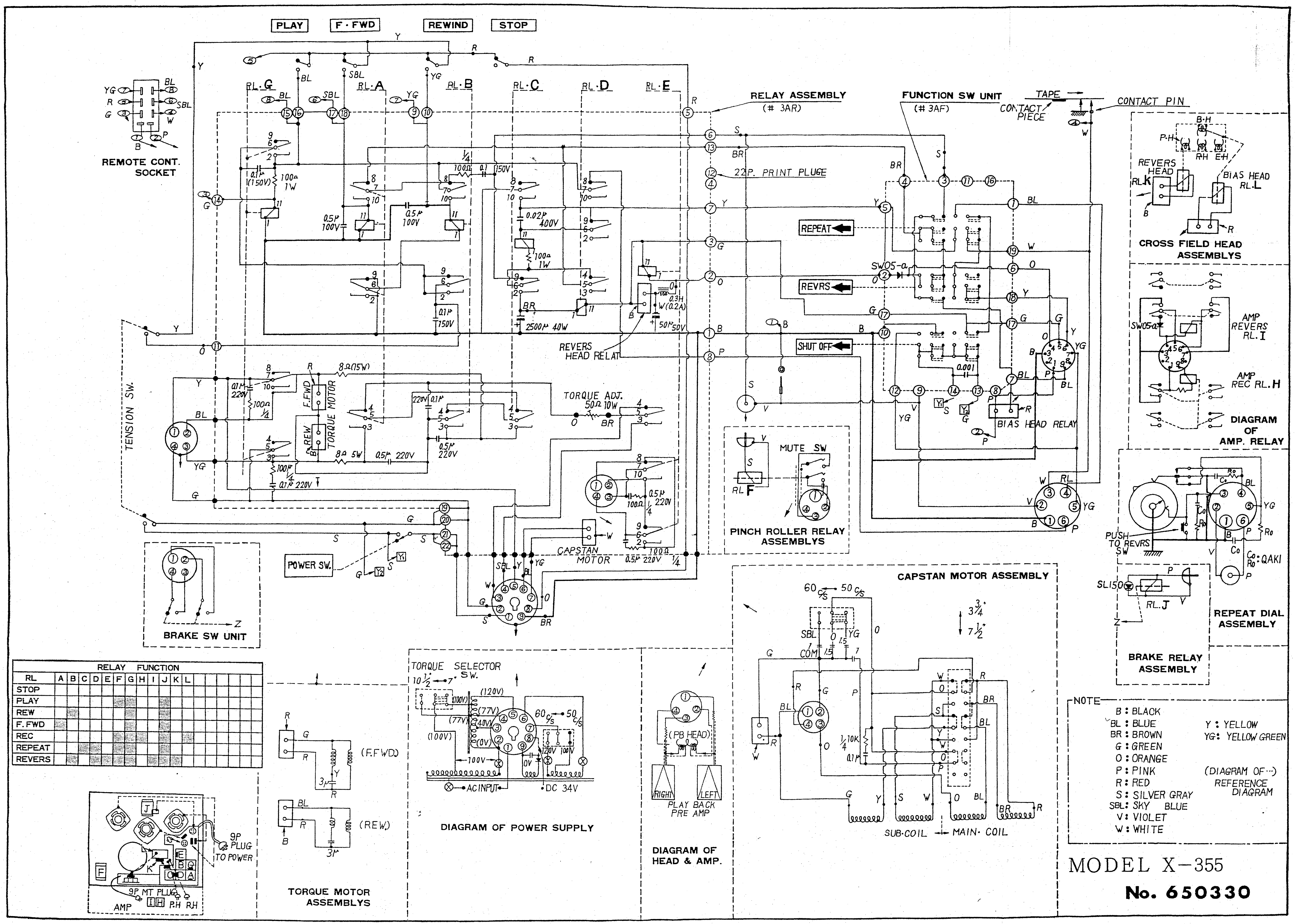
21-001	Main amplifier Card comp.
002	Printed Plate, Main Amplifier Card
003	Radiative Plate
004	Radiative Plate, Transistor
005	Holder, Printed Plate
006a	Tubular Type Electrolytic Condenser 500μ F 3V
21-006b	Tubular Type Electrolytic Condenser 10μ F 6V
006c	Tubular Type Electrolytic Condenser 500μ F 6V
006d	Tubular Type Electrolytic Condenser 50μ F 10V
006e	Mylar Condenser 0.015μ F 50V K
006f	Mylar Condenser 0.022μ F 50V K
006g	Mylar Condenser 330P 35WV K
007a	Resistor 1/4P 12 ohms K
007b	Resistor 1/4P 150 ohms K
007c	Resistor 1/4P 150 ohms J
007d	Resistor 1/4P 470 ohms J
007e	Resistor 1/4P 1K ohms J
007f	Resistor 1/4P 1.2K ohms J
007g	Resistor 1/4P 3.3K ohms K
007h	Resistor 1/4P 5.6K ohms J
007i	Resistor 1/4P 30K ohms J
007j	Resistor 1/4P 15K ohms J
007k	Resistor 1/4P 100K ohms K
007l	Resistor 1/2P 680 ohms K
008	Wired Resistor 3/4WL 0.5 ohms K
009	Half Fixed Resistor 300 ohms (B)
010	Driver Transformer N-35-2052
011a	Transistor 2SB 75 (A)
011b	Transistor 2SB 370A (A)
012	Thermister 13D27
013	Screw, (+) 2.3×5
014	2.3mm Nut

OSCILLATOR CARD

22-001	Oscillator Card Comp.
002	Printed Plate, Oscillator Card
003	Chassis, Oscillator
004	Prop A, Switch
005	Radiative Plate
006	Transistor 2SB 370A (B)
007a	Tubular Type Electrolytic Condenser 100μ F 6V
007b	Oil Condenser 0.01μ F 400WV
008a	Resistor 1W 36 ohms J
008b	Resistor 1/4P 20K ohms J
008c	Resistor 1/4P 3K ohms J
009	Oscillator Coil
010	Plastic condenser 0.06μ F 400WV
011	Screw, (+) 3×12
012	M3 Nut
013	Screw, (+) 3×8
014	Screw, (+) 3×5
015	M3 Nut

AMPLIFIER PANEL BLOCK

23-001	Amplifier Panel
002	Escutcheon, VU Meter
003	Escutcheon B, Recording Lamp
004	Escutcheon, Recording Button
005a	Knob A, Amplifier
005b	Knob B, Amplifier
006	Push Button (P.B/REC. OUTPUT)


PLAY
F・FWD
REWIND
STOP
REMOTE CONT. SOCKET
RL・G
RL・A
RL・B
RL・C
RL・D
RL・E
RELAY ASSEMBLY
(# 3AR)
FUNCTION SW UNIT
(# 3AF)
TAPE
CONTACT PIECE
CONTACT PIN
22P. PRINT PLUGE
REPEAT
REVRS
SHUT OFF
SW05-a
REVERS HEAD RELAY
TENSION SW.
F.FWD
REW
TORQUE MOTOR
TORQUE ADJ.
50Ω 10W
8Ω(15W)
CAPSTAN MOTOR
POWER SW.
BRAKE SW UNIT
MUTE SW
RL F
PINCH ROLLER RELAY ASSEMBLYS
BIAS HEAD RELAY
REVERS HEAD
RL.K
BIAS HEAD
RL.L
P.H
R.H
E.H
B.H
CROSS FIELD HEAD ASSEMBLYS
AMP REVERS RL.I
AMP REC RL.H
DIAGRAM OF AMP. RELAY
PUSH TO REVRS SW
Co:QAKI
SL150
RL.J
REPEAT DIAL ASSEMBLY
BRAKE RELAY ASSEMBLY
CAPSTAN MOTOR ASSEMBLY
60 c/s
50 c/s
3 3/4
7 1/2
COM
SUB・COIL
MAIN・COIL
TORQUE SELECTOR SW.
10 1/2
7
(120V)
(100V)
(77V)
(40V)
(0V)
AC INPUT
DC 34V
DIAGRAM OF POWER SUPPLY
(PB HEAD)
RIGHT
LEFT
PLAY BACK PRE AMP
DIAGRAM OF HEAD & AMP.
(F.FWD)
(REW)
TORQUE MOTOR ASSEMBLYS
9P PLUG TO POWER
9P MT PLUG
AMP
P.H
R.H

RL	A	B	C	D	E	F	G	H	I	J	K	L						
STOP																		
PLAY						▨	▨			▨								
REW		▨					▨			▨								
F.FWD	▨						▨			▨								
REC						▨	▨	▨		▨		▨						
REPEAT			▨	▨		▨	▨			▨								
REVERS		▨		▨	▨	▨	▨		▨	▨	▨							

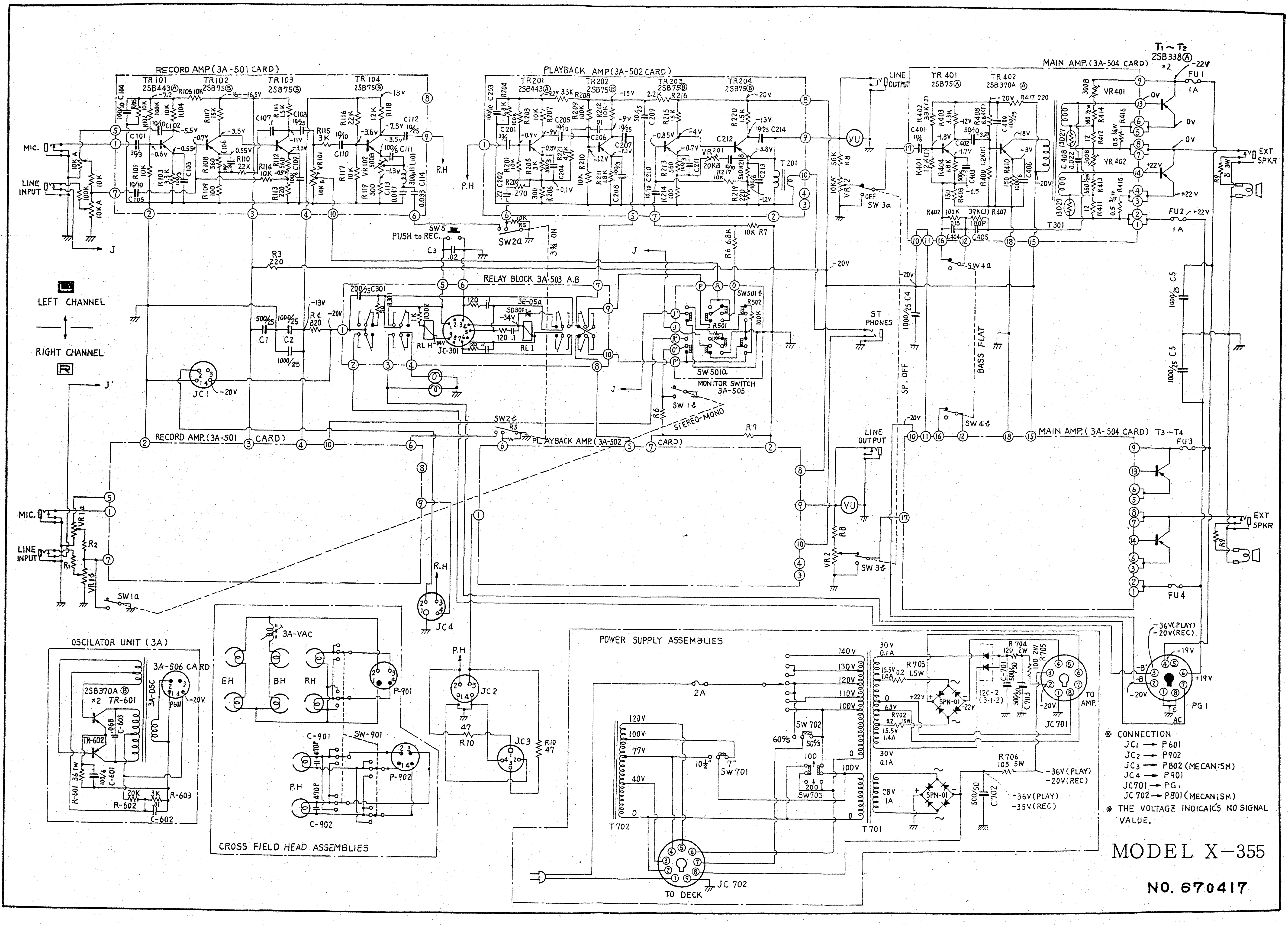
NOTE

B : BLACK
BL : BLUE
BR : BROWN
G : GREEN
O : ORANGE
P : PINK
R : RED
S : SILVER GRAY
SBL : SKY BLUE
V : VIOLET
W : WHITE
Y : YELLOW
YG : YELLOW GREEN

(DIAGRAM OF…) REFERENCE DIAGRAM

MODEL X-355

No. 650330


RECORD AMP (3A-501 CARD)
TR 101 2SB443Ⓐ
TR102 2SB75Ⓑ
TR103 2SB75Ⓑ
TR 104 2SB75Ⓑ
PLAYBACK AMP (3A-502 CARD)
TR201 2SB443Ⓐ
TR202 2SB75Ⓑ
TR203 2SB75Ⓑ
TR204 2SB75Ⓑ
MAIN AMP. (3A-504 CARD)
TR 401 2SB75Ⓐ
TR 402 2SB370A Ⓐ
T₁ ~ T₂ 2SB338Ⓐ ×2
FU1 1A
FU2 1A
FU3
FU4
LINE OUTPUT
VU
EXT SPKR
ST PHONES
SP. OFF
BASS FLAT
SW 3a
SW 3b
SW 4a
SW 4b
MIC.
LINE INPUT
SW5 PUSH to REC.
SW2a
SW2b
3¾ ON
RELAY BLOCK 3A-503 A.B
SD301
SE-05a
RL H
RL 1
JC-301
LEFT CHANNEL
RIGHT CHANNEL
MONITOR SWITCH 3A-505
SW501a
SW501b
SW 1b
SW1a
STEREO-MONO
JC 1
JC4
JC2
JC3
R.H
P.H
MAIN AMP. (3A-504 CARD) T3 ~ T4
RECORD AMP. (3A-501 CARD)
PLAYBACK AMP. (3A-502 CARD)
OSCILLATOR UNIT (3A)
3A-506 CARD
2SB370A Ⓑ ×2 TR-601
TR-602
3A-OSC
P601
CROSS FIELD HEAD ASSEMBLIES
3A-VAC
EH
BH
RH
P-901
C-901
C-902
SW-901
P-902
POWER SUPPLY ASSEMBLIES
T 702
T 701
SW 701
SW 702
SW703
SPN-01
JC 701
TO AMP.
JC 702
TO DECK
PG 1
-36V (PLAY)
-20V (REC)
-35V (REC)

※ CONNECTION
JC₁ → P601
JC₂ → P902
JC₃ → P802 (MECAN;SM)
JC4 → P901
JC701 → PG₁
JC 702 → P801 (MECAN;SM)

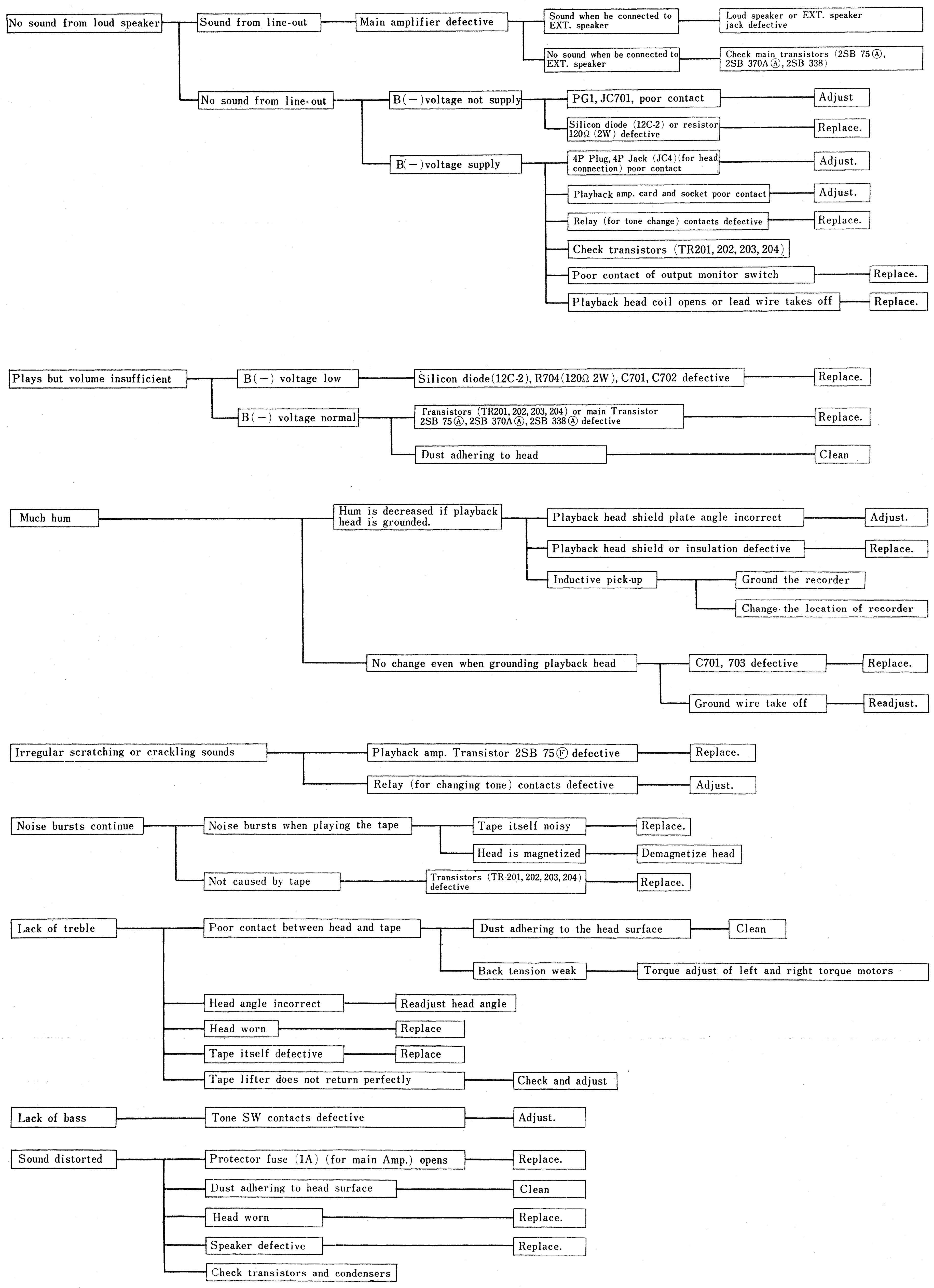
※ THE VOLTAGZ INDICAICS NO SIGNAL VALUE.

MODEL X-355

NO. 670417

XI. TROUBLE SHOOTING CHART

TROUBLE WITH PLAYBACK SYSTEM (AMPLIFIER)


No sound from loud speaker
Sound from line-out
Main amplifier defective
Sound when be connected to EXT. speaker
Loud speaker or EXT. speaker jack defective
No sound when be connected to EXT. speaker
Check main transistors (2SB 75Ⓐ, 2SB 370AⒶ, 2SB 338)
No sound from line-out
B(−)voltage not supply
PG1, JC701, poor contact
Adjust
Silicon diode (12C-2) or resistor 120Ω (2W) defective
Replace.
B(−)voltage supply
4P Plug, 4P Jack (JC4)(for head connection) poor contact
Adjust.
Playback amp. card and socket poor contact
Adjust.
Relay (for tone change) contacts defective
Replace.
Check transistors (TR201, 202, 203, 204)
Poor contact of output monitor switch
Replace.
Playback head coil opens or lead wire takes off
Replace.
Plays but volume insufficient
B(−) voltage low
Silicon diode(12C-2), R704(120Ω 2W), C701, C702 defective
Replace.
B(−) voltage normal
Transistors (TR201, 202, 203, 204) or main Transistor 2SB 75Ⓐ, 2SB 370AⒶ, 2SB 338Ⓐ defective
Replace.
Dust adhering to head
Clean
Much hum
Hum is decreased if playback head is grounded.
Playback head shield plate angle incorrect
Adjust.
Playback head shield or insulation defective
Replace.
Inductive pick-up
Ground the recorder
Change the location of recorder
No change even when grounding playback head
C701, 703 defective
Replace.
Ground wire take off
Readjust.
Irregular scratching or crackling sounds
Playback amp. Transistor 2SB 75Ⓕ defective
Replace.
Relay (for changing tone) contacts defective
Adjust.
Noise bursts continue
Noise bursts when playing the tape
Tape itself noisy
Replace.
Head is magnetized
Demagnetize head
Not caused by tape
Transistors (TR-201, 202, 203, 204) defective
Replace.
Lack of treble
Poor contact between head and tape
Dust adhering to the head surface
Clean
Back tension weak
Torque adjust of left and right torque motors
Head angle incorrect
Readjust head angle
Head worn
Replace
Tape itself defective
Replace
Tape lifter does not return perfectly
Check and adjust
Lack of bass
Tone SW contacts defective
Adjust.
Sound distorted
Protector fuse (1A) (for main Amp.) opens
Replace.
Dust adhering to head surface
Clean
Head worn
Replace.
Speaker defective
Replace.
Check transistors and condensers

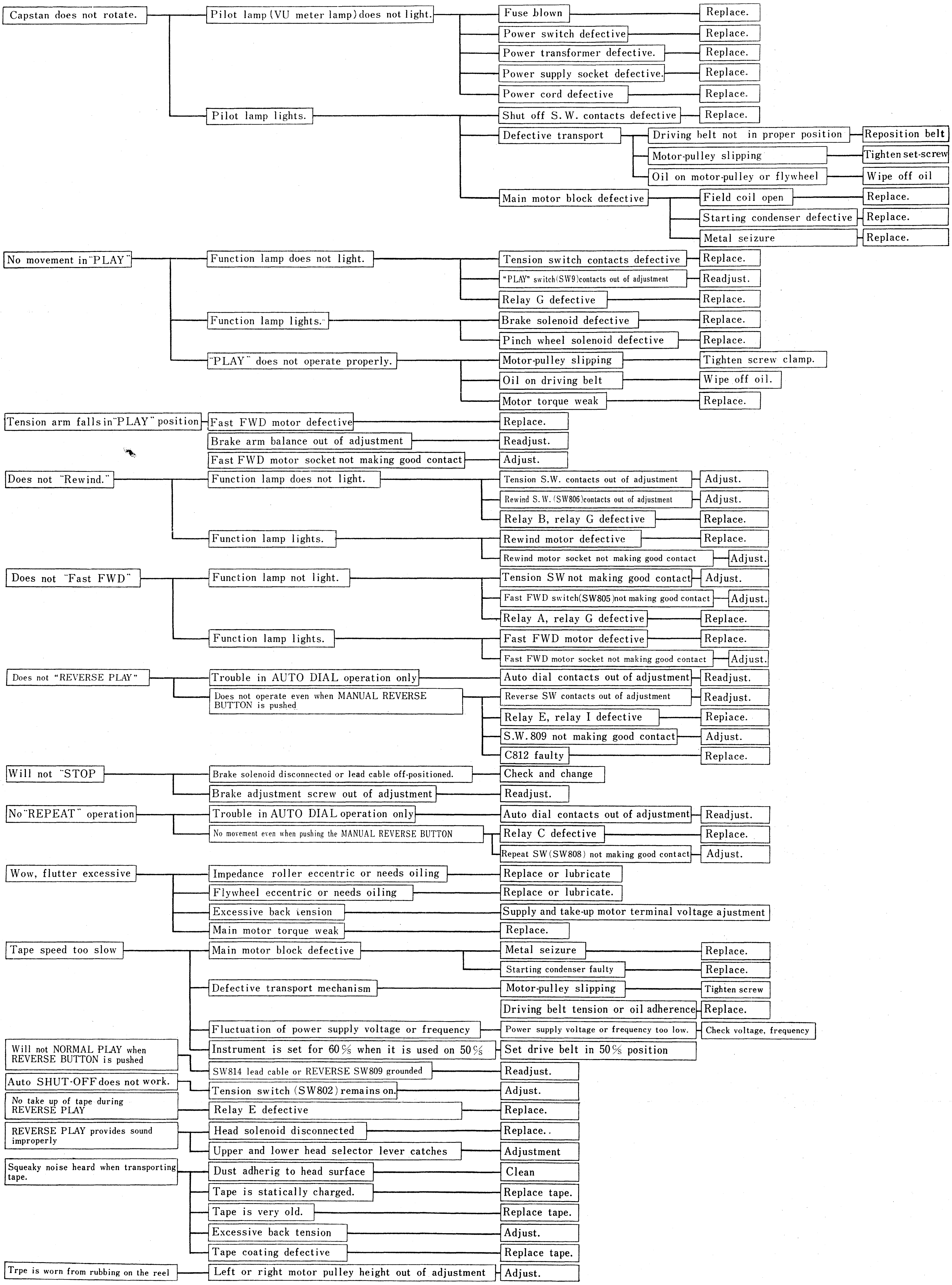
RECORDING SYSTEM TROUBLES (AMPLIFIER)

- No recording possible
  - Recording lamp does not light.
    - Relay (RLH) defetive
      - Replace
    - Relay power supply plug(P-803) does not contact with socket (JC-301).
      - Readjust
  - Recording lamp lights
    - VU meter does not indicate.
      - VU meter defective or lead wire defective
        - Replace and adjust
      - Input jack cntacts not making properly.
        - Replace
      - Record monitor switch contacts out of adjustment
        - Adjust
      - Transistors (TR101, 102, 103) defective
        - Replace
    - VU meter indication is normal.
      - Transistor (TR104) or C112 defective
        - Replace
      - Recording head defective
        - Replace.
      - Components of oscillator circuit or oscillator coil defective.
        - Replace.
- Sound is distorted.
  - Sound undistorted at RECORD MONITOR SW "IN"
    - Record bias voltage incorrect
      - Readjust.
    - Record bias voltage adjustment coil (3A-VAC) disconnected
      - Replace.
    - L101 (peaking coil) defective
      - Replace.
    - Recording head defective
      - Replace.
  - Sound distorted at RECORD MONITOR SW "IN"
    - TR101, 102, 103 defective
      - Replace.
    - Condensers of TR101, 102, 103 circuit defective
      - Replace.
    - Excessive input due to decreased sensitivity of the VU meter
      - Replace
- Faulty erasing
  - Does not erase at all.
    - Erase head defective
      - Check and replace
    - Excessive amount of dust adhering to surface of erase head
      - Clean.
  - Incomplete erasure
    - Erasing bias voltage low
      - Transistor 2SB 370A Ⓑ defective
        - Replace.
      - Oscillator coil (3A-OSL) defective
        - Replace.
      - Erase head coil defective.
        - Replace.
- Still noisy
  - Transistor 2SB 75 Ⓕ of recording amp. defective
    - Replace.
  - Bias oscillator wave-form distorted
    - Oscillatior circuit balance faulty
      - Transistor (2SB 370A Ⓑ) or oscillator coil defective
        - Replace.
  - Head magnetized
    - Demagnetize head
  - Tape itself defective
    - Replace.
  - Bias voltage out of adjustment
    - Readjust.
- Recording sensitivity low
  - Sound normal at RECORD MONITOR SW "IN"
    - Dust adhering to head surface
      - Clean.
    - Bias voltage out of adjustment
      - Readjust.
    - TR104 (25B 75 Ⓑ) defective
      - Replace.
    - Tape itself defective
      - Replace.
  - Sound low at RECORD MONITOR SW "IN"
    - TR101, 102, 103 defective
      - Replace.
    - Input jack contacts not making properly.
      - Adjust
    - TR101, 102, 103 circuit CR defective
      - Replace.
    - VU meter sensitivity low
      - Replace.
- Sound fades or drops out.
  - Dust adhering to the head surface
    - Clean.
  - Tape itself dirt
    - Replace.
  - Back tension too weak
    - Adjust.
  - Recording bias voltage too low
    - Adjust.
  - Impedance roller eccentric
    - Replace.
  - Unusual wear of head
    - Replace.
- Large difference between left and right levels when recording.
  - Large deviation from line V.R. (VR4) curve
    - Replace.
  - Recording level out of adjstment
    - Readjust.

TROUBLE IN BOTH RECORDING AND PLAYBACK (AMPLIFIER)

- Excessive crosstalk
  - Head not properly positioned
    - Adjust
  - Head shield defective
    - Replace.
  - Head lead cable cable shield defective
    - Adjust
- No sound on sound recording
  - REC/PLAYBACK OUTPUT SW contact out of adjustment
    - Adjust.
  - LINE input jack contacts not properly
    - Adjust.

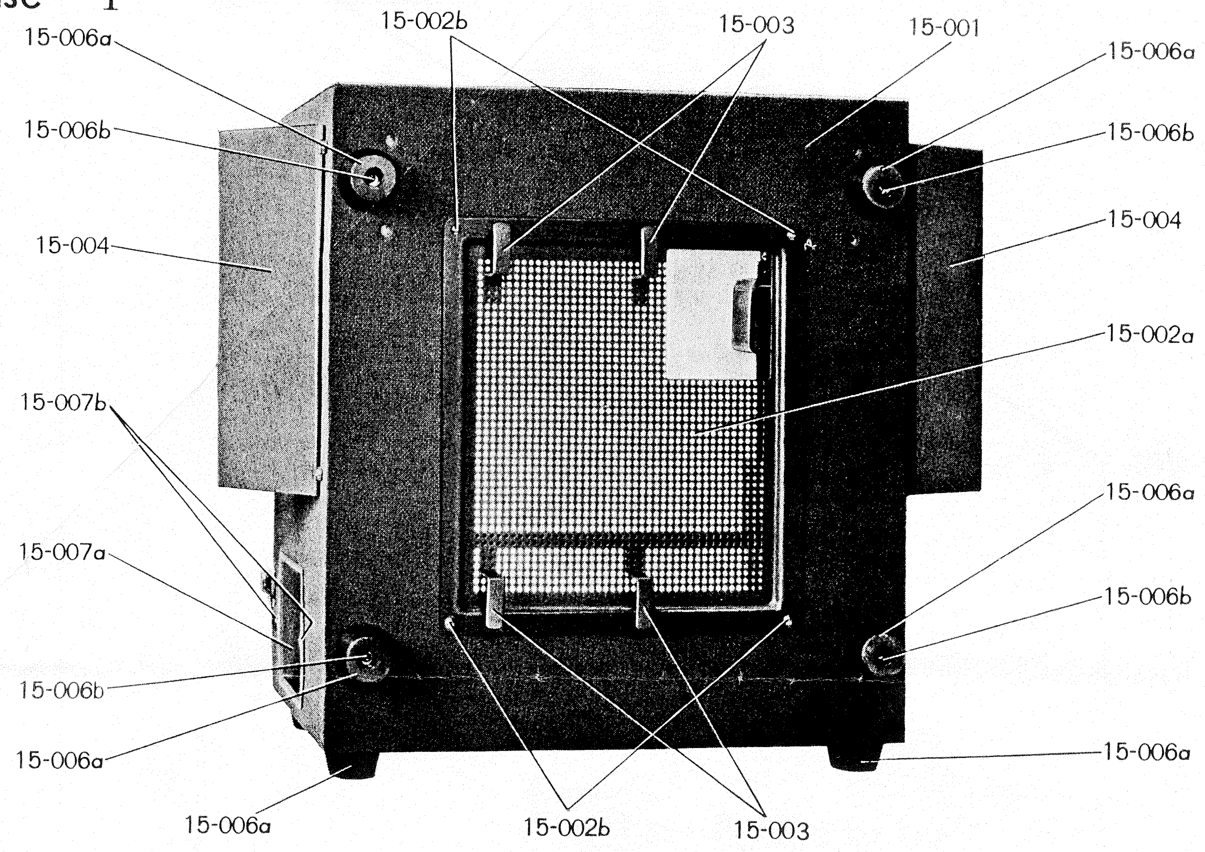
TROUBLES WITH TAPE TRANSPORT MECHANISM.



Capstan does not rotate.	Pilot lamp (VU meter lamp) does not light.	Fuse blown		Replace.
		Power switch defective		Replace.
		Power transformer defective.		Replace.
		Power supply socket defective.		Replace.
		Power cord defective		Replace.
	Pilot lamp lights.	Shut off S.W. contacts defective		Replace.
		Defective transport	Driving belt not in proper position	Reposition belt
			Motor-pulley slipping	Tighten set-screw
			Oil on motor-pulley or flywheel	Wipe off oil
		Main motor block defective	Field coil open	Replace.
			Starting condenser defective	Replace.
			Metal seizure	Replace.
No movement in "PLAY"	Function lamp does not light.	Tension switch contacts defective		Replace.
		"PLAY" switch (SW9) contacts out of adjustment		Readjust.
		Relay G defective		Replace.
	Function lamp lights.	Brake solenoid defective		Replace.
		Pinch wheel solenoid defective		Replace.
	"PLAY" does not operate properly.	Motor-pulley slipping		Tighten screw clamp.
		Oil on driving belt		Wipe off oil.
		Motor torque weak		Replace.
Tension arm falls in "PLAY" position	Fast FWD motor defective			Replace.
	Brake arm balance out of adjustment			Readjust.
	Fast FWD motor socket not making good contact			Adjust.
Does not "Rewind."	Function lamp does not light.	Tension S.W. contacts out of adjustment		Adjust.
		Rewind S.W. (SW806) contacts out of adjustment		Adjust.
		Relay B, relay G defective		Replace.
	Function lamp lights.	Rewind motor defective		Replace.
		Rewind motor socket not making good contact		Adjust.
Does not "Fast FWD"	Function lamp not light.	Tension SW not making good contact		Adjust.
		Fast FWD switch (SW805) not making good contact		Adjust.
		Relay A, relay G defective		Replace.
	Function lamp lights.	Fast FWD motor defective		Replace.
		Fast FWD motor socket not making good contact		Adjust.
Does not "REVERSE PLAY"	Trouble in AUTO DIAL operation only	Auto dial contacts out of adjustment		Readjust.
	Does not operate even when MANUAL REVERSE BUTTON is pushed	Reverse SW contacts out of adjustment		Readjust.
		Relay E, relay I defective		Replace.
		S.W. 809 not making good contact		Adjust.
		C812 faulty		Replace.
Will not "STOP"	Brake solenoid disconnected or lead cable off-positioned.			Check and change
	Brake adjustment screw out of adjustment			Readjust.
No "REPEAT" operation	Trouble in AUTO DIAL operation only	Auto dial contacts out of adjustment		Readjust.
	No movement even when pushing the MANUAL REVERSE BUTTON	Relay C defective		Replace.
		Repeat SW (SW808) not making good contact		Adjust.
Wow, flutter excessive	Impedance roller eccentric or needs oiling			Replace or lubricate
	Flywheel eccentric or needs oiling			Replace or lubricate.
	Excessive back tension			Supply and take-up motor terminal voltage ajustment
	Main motor torque weak			Replace.
Tape speed too slow	Main motor block defective	Metal seizure		Replace.
		Starting condenser faulty		Replace.
	Defective transport mechanism	Motor-pulley slipping		Tighten screw
		Driving belt tension or oil adherence		Replace.
	Fluctuation of power supply voltage or frequency	Power supply voltage or frequency too low.		Check voltage, frequency
	Instrument is set for 60% when it is used on 50%			Set drive belt in 50% position
Will not NORMAL PLAY when REVERSE BUTTON is pushed	SW814 lead cable or REVERSE SW809 grounded			Readjust.
Auto SHUT-OFF does not work.	Tension switch (SW802) remains on.			Adjust.
No take up of tape during REVERSE PLAY	Relay E defective			Replace.
REVERSE PLAY provides sound improperly	Head solenoid disconnected			Replace..
	Upper and lower head selector lever catches			Adjustment
Squeaky noise heard when transporting tape.	Dust adherig to head surface			Clean
	Tape is statically charged.			Replace tape.
	Tape is very old.			Replace tape.
	Excessive back tension			Adjust.
	Tape coating defective			Replace tape.
Trpe is worn from rubbing on the reel	Left or right motor pulley height out of adjustment			Adjust.

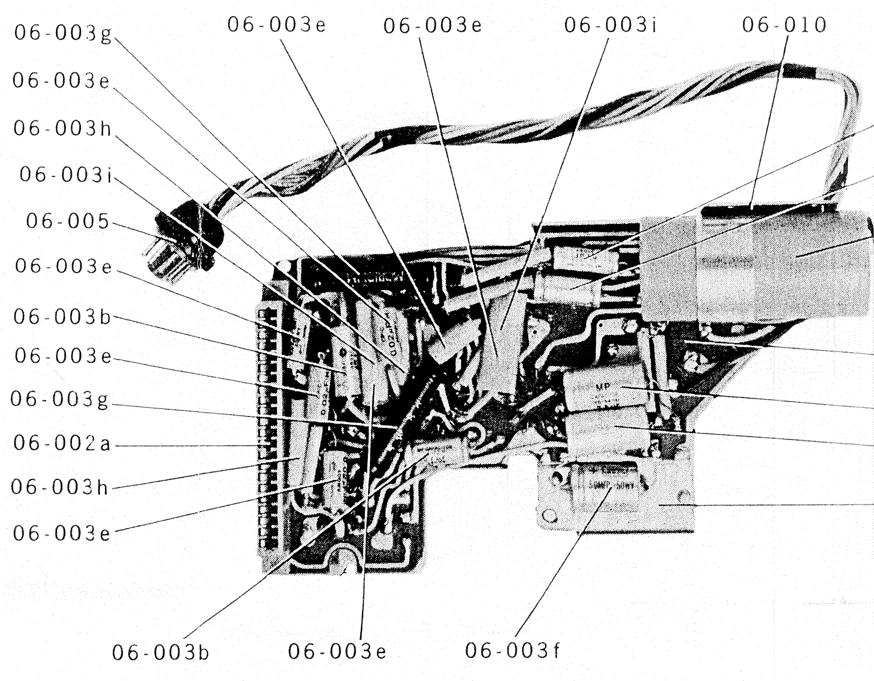
EXPLODED VIEW OF COMPONENT PARTS

Case I



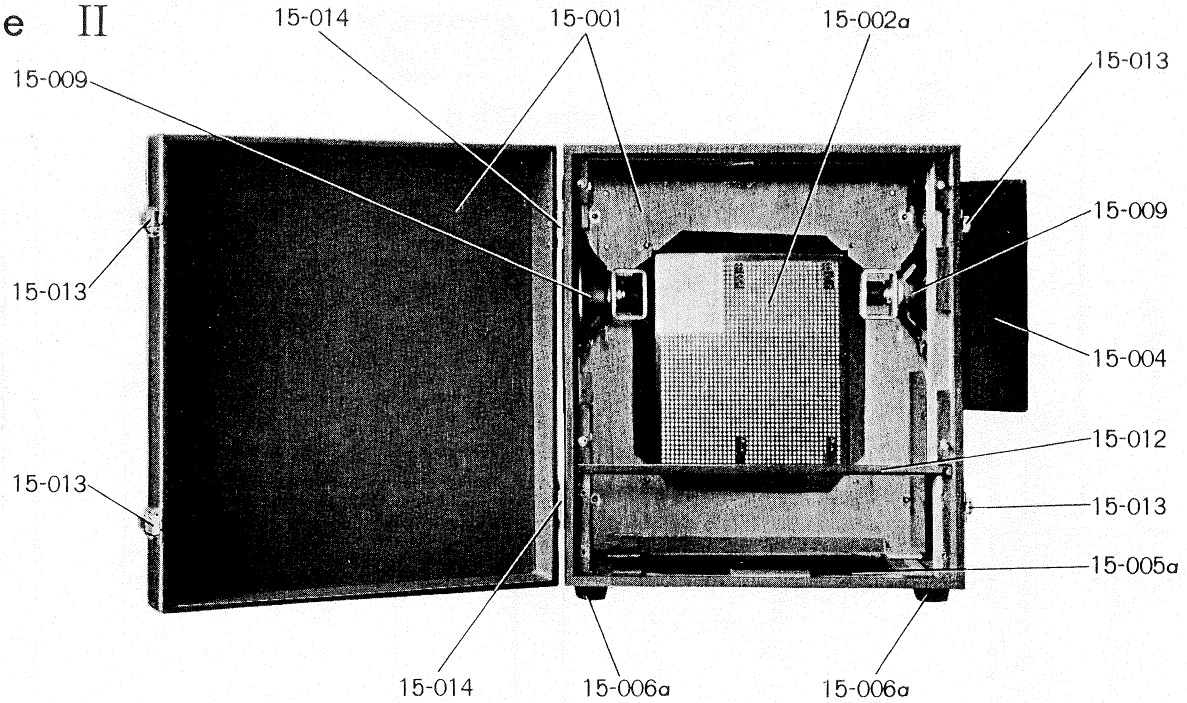
15-006a
15-002b
15-003
15-001
15-006a
15-006b
15-006b
15-004
15-004
15-002a
15-007b
15-006a
15-007a
15-006b
15-006b
15-006a
15-006a
15-006a
15-002b
15-003

Mechanism Relay Block



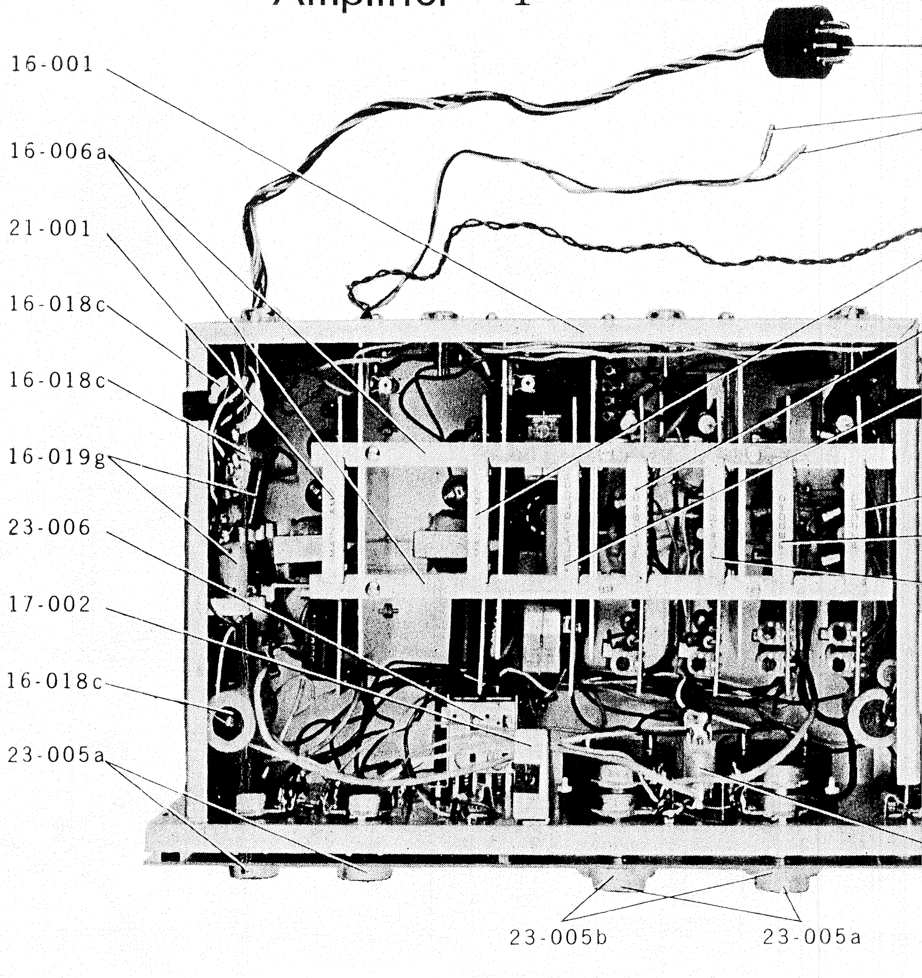
06-003g
06-003e
06-003e
06-003i
06-010
06-003e
06-003h
06-003i
06-005
06-003e
06-003b
06-003e
06-003g
06-002a
06-003h
06-003e
06-003b
06-003e
06-003f

Case II



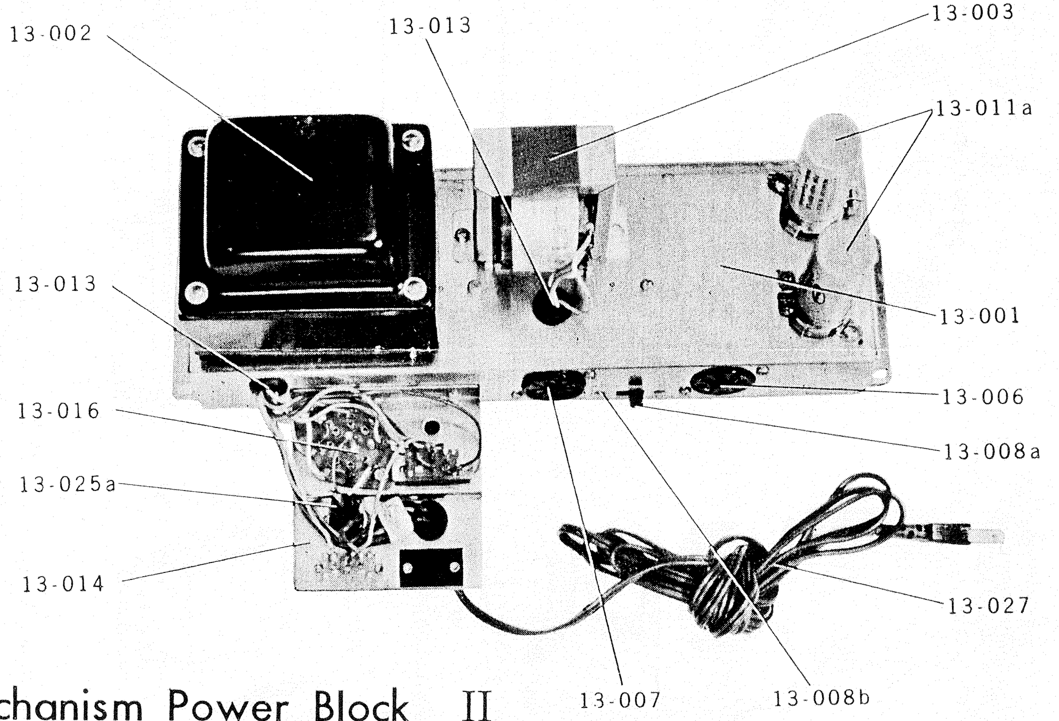
15-014
15-001
15-002a
15-013
15-009
15-009
15-013
15-004
15-012
15-013
15-013
15-005a
15-014
15-006a
15-006a

Amplifier I



16-001
16-006a
21-001
16-018c
16-018c
16-019g
23-006
17-002
16-018c
23-005a
23-005b
23-005a

Mechanism Power Block I



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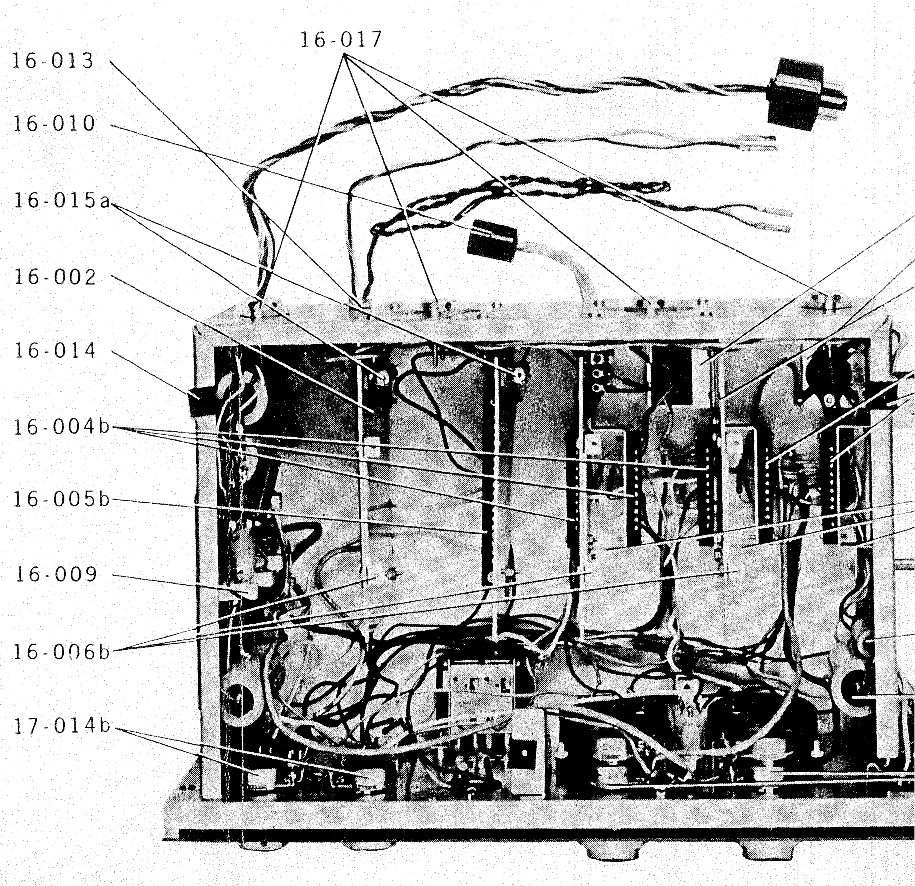
13-003
13-011a
13-013
13-001
13-006
13-016
13-008a
13-025a
13-014
13-027
13-007
13-008b

Amplifier II



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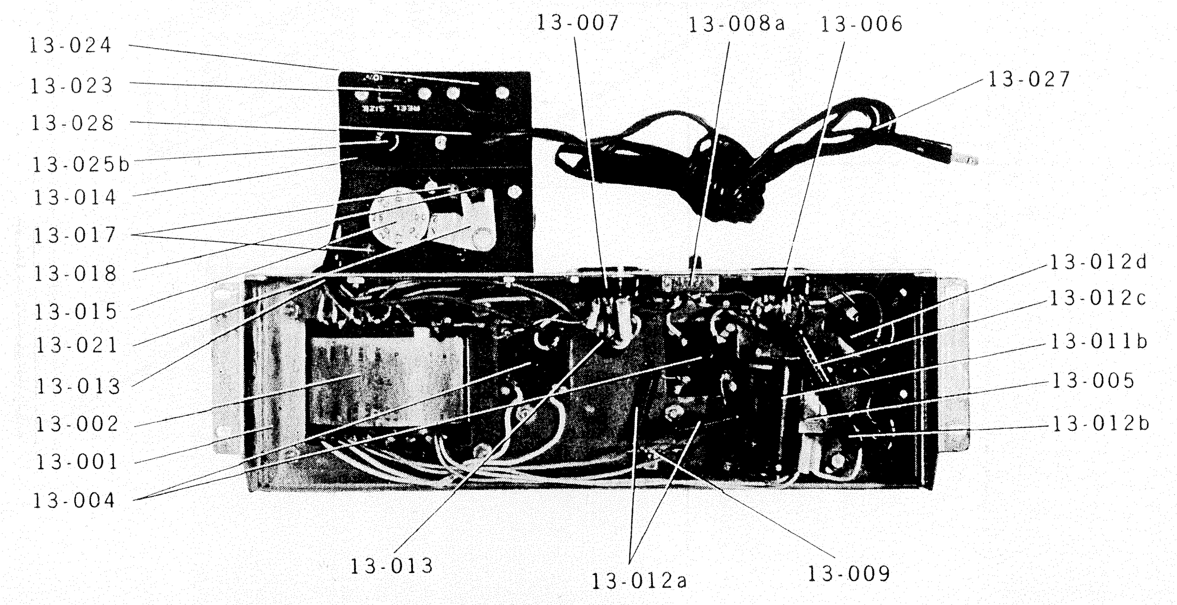
16-013
16-010
16-015a
16-002
16-014
16-004b
16-005b
16-009
16-006b
17-014b

Mechanism Power Block II



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13-006
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13-027
13-023
13-028
13-025b
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13-017
13-018
13-015
13-021
13-013
13-002
13-001
13-004
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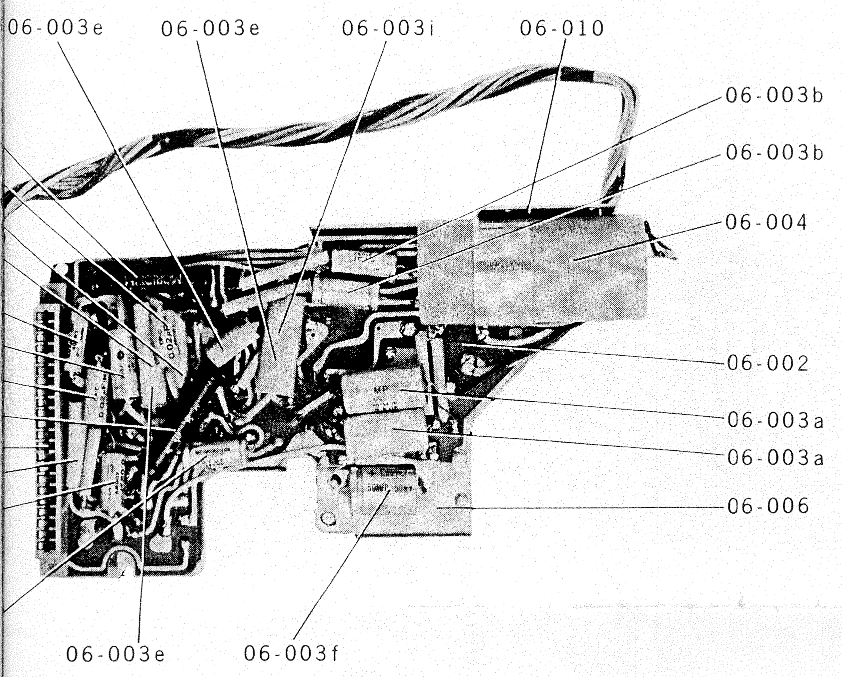
13-012c
13-011b
13-005
13-012b
13-013
13-012a
13-009

Mechanism Relay Block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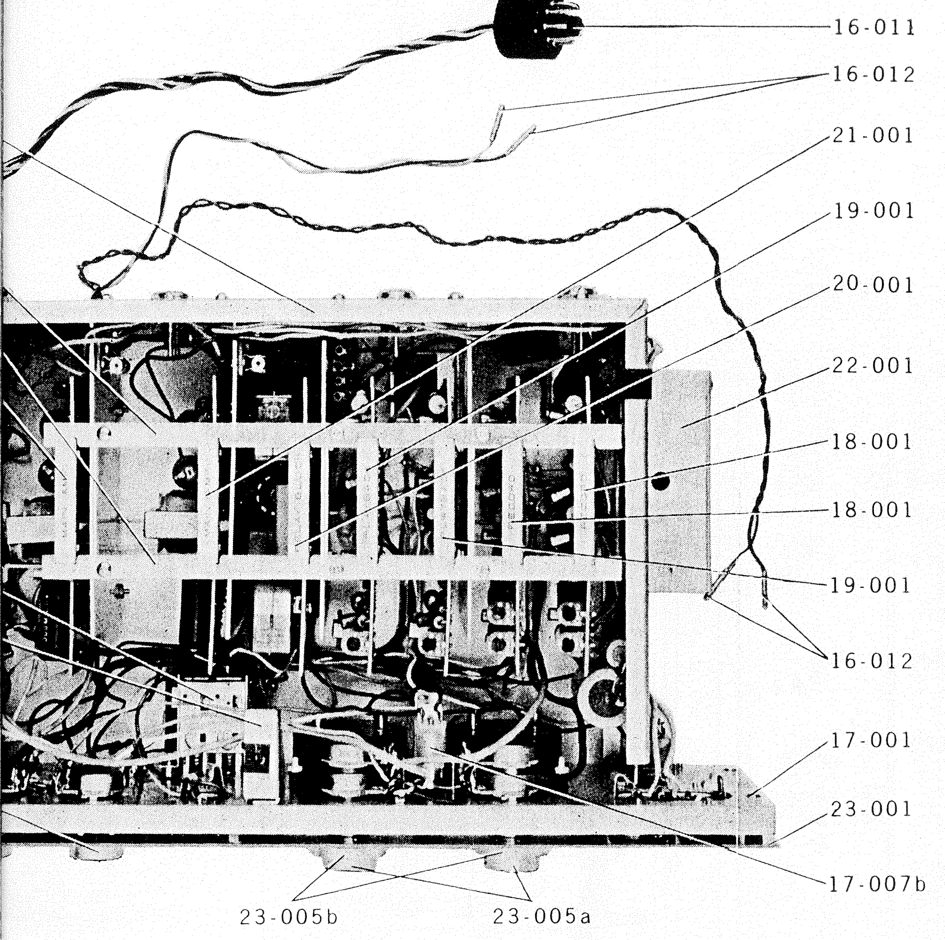
06-003e
06-003i
06-010
06-003b
06-003b
06-004
06-002
06-003a
06-003a
06-006
06-003e
06-003f

Amplifier I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16-012
21-001
19-001
20-001
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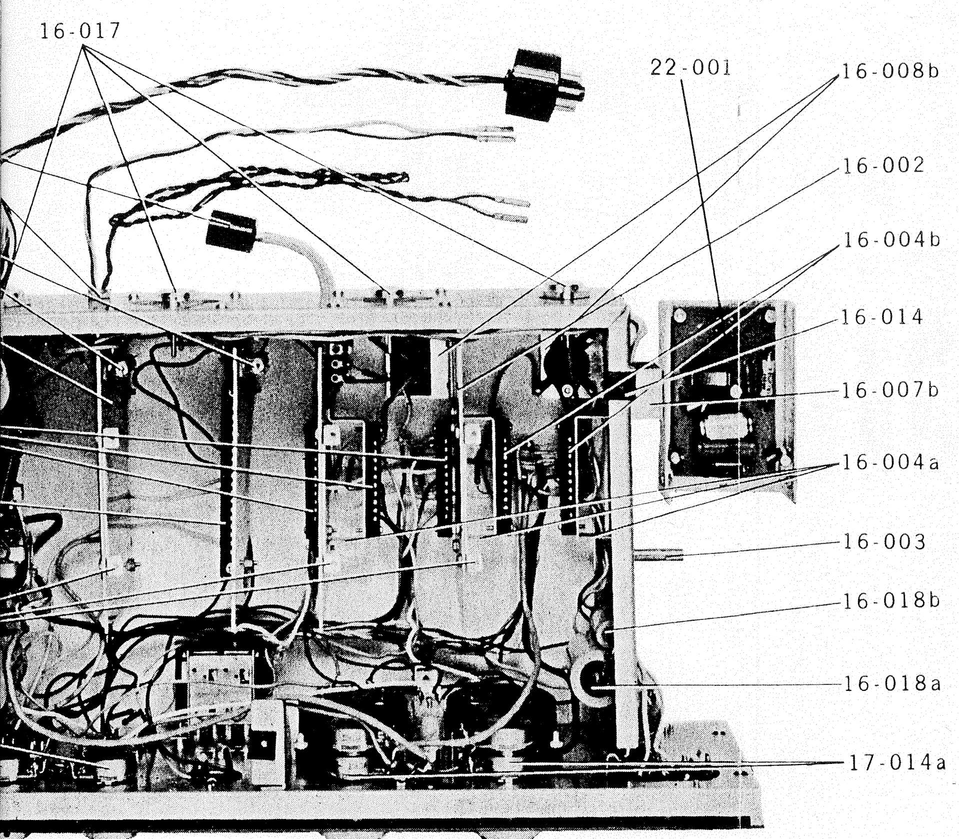
18-001
18-001
19-001
16-012
17-001
23-001
17-007b
23-005b
23-005a

Amplifier II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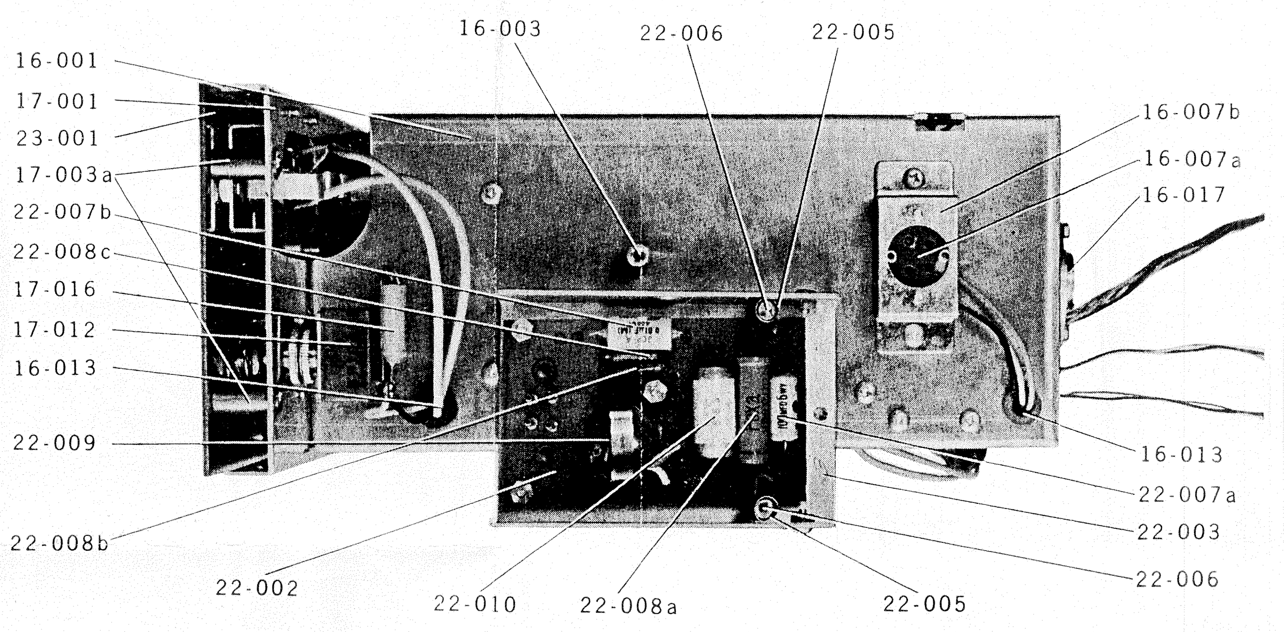
16-004a
16-003
16-018b
16-018a
17-014a

Amplifier III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23-001
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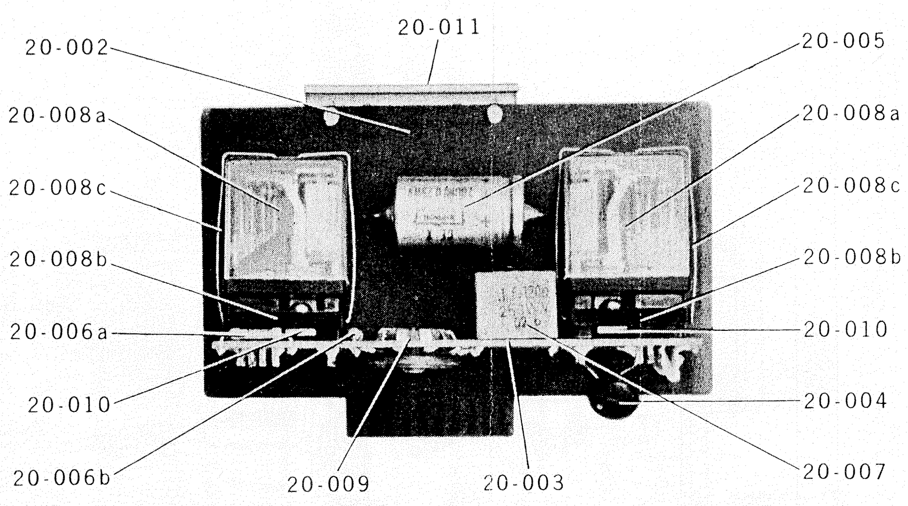
17-016
17-012
16-013
22-009
22-008b
22-002
22-010
22-008a
22-005
16-007b
16-007a
16-017
16-013
22-007a
22-003
22-006

Amplifier IV

RELAY BLOCK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20-005
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20-008a
20-008c
20-008c
20-008b
20-008b
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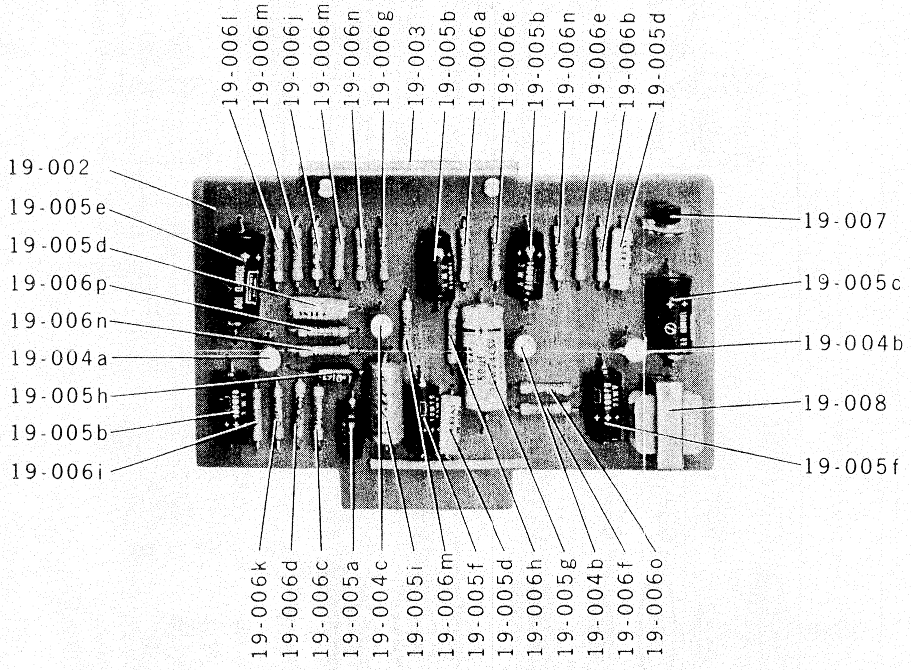
20-010
20-004
20-006b
20-009
20-003
20-007

PLAYBACK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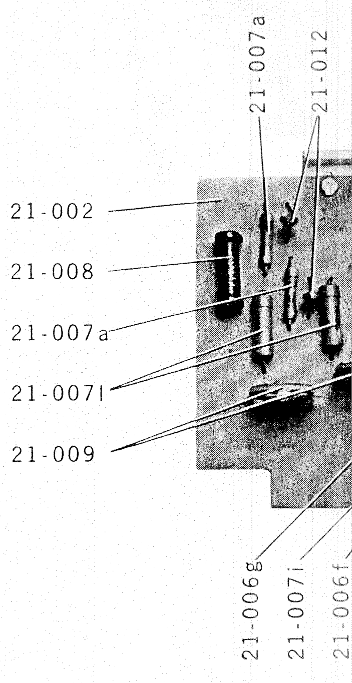
19-006m
19-006j
19-006m
19-006n
19-006g
19-003
19-005b
19-006a
19-006e
19-005b
19-006n
19-006e
19-006b
19-005d
19-002
19-005e
19-005d
19-006p
19-006n
19-004a
19-005h
19-005b
19-006i
19-007
19-005c
19-004b
19-008
19-005f
19-006k
19-006d
19-006c
19-005a
19-004c
19-005i
19-006m
19-005f
19-005d
19-006h
19-005g
19-004b
19-006f
19-006o

MAI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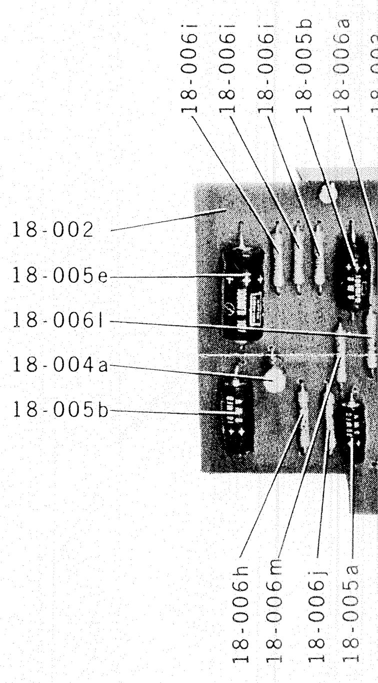
21-002
21-008
21-007a
21-007l
21-009
21-006g
21-007i
21-006f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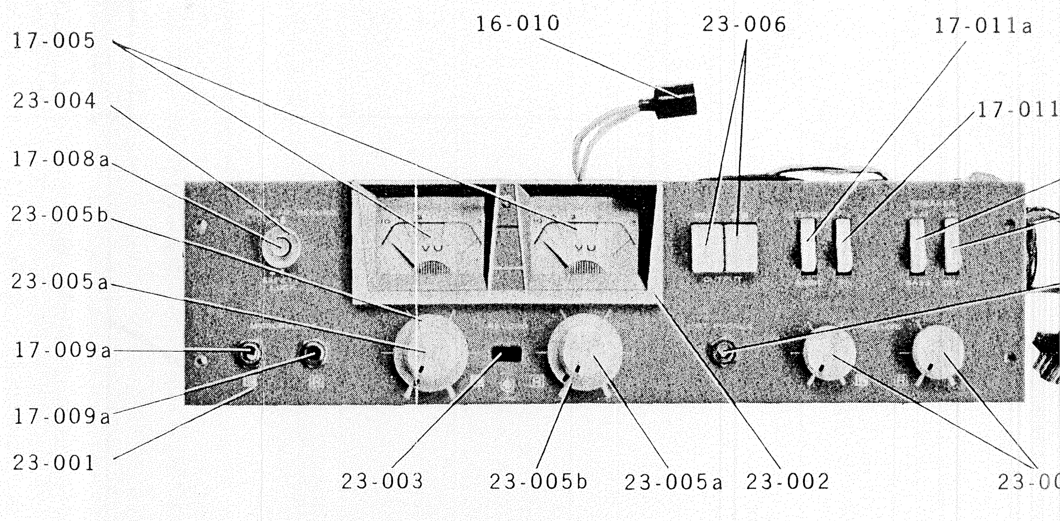
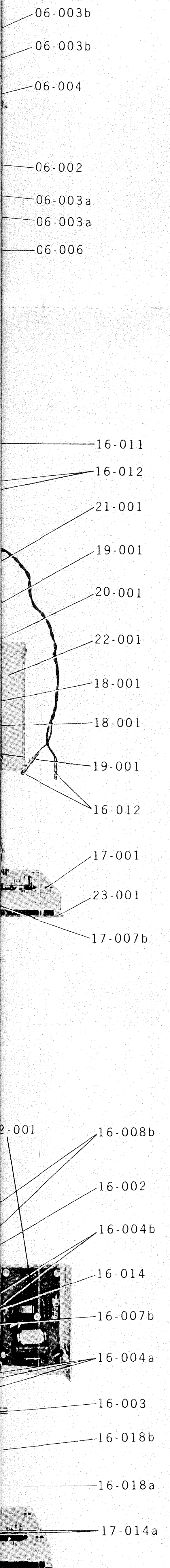
18-006i
18-006i
18-005b
18-006a
18-002
18-005e
18-006l
18-004a
18-005b
18-006h
18-006m
18-006j
18-005a

Amplifier V


16-010
23-006
17-011a
17-005
23-004
17-008a
23-005b
23-005a
17-009a
17-009a
23-001
17-011
23-003
23-005b
23-005a
23-002
23-00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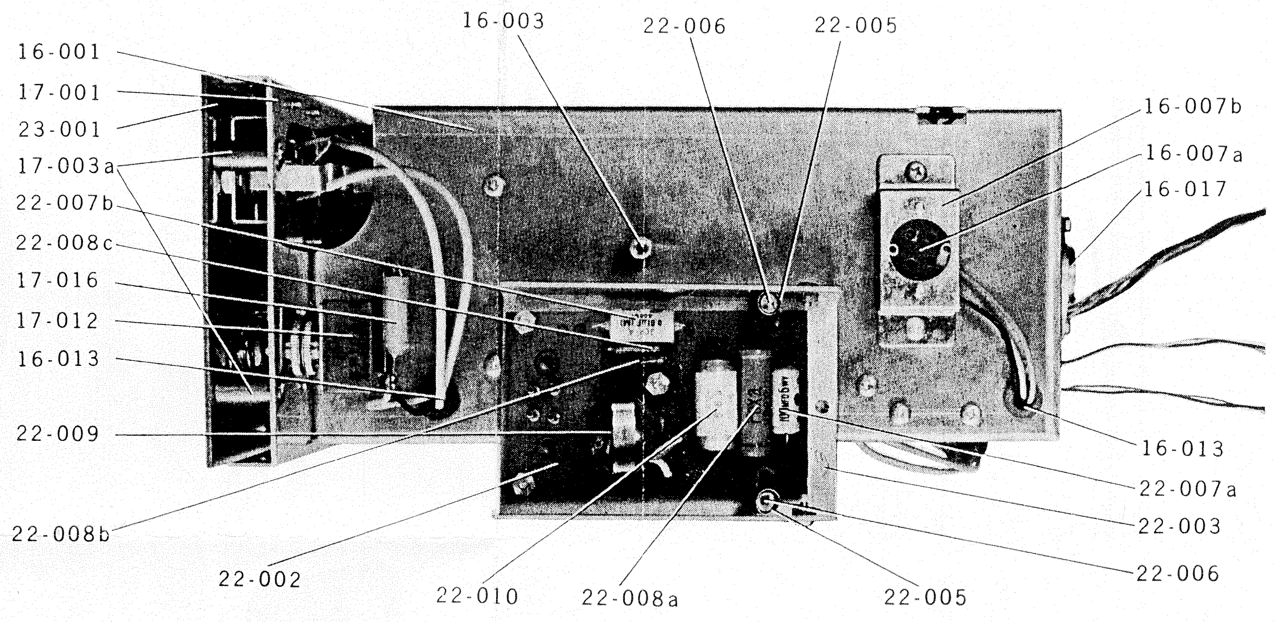
06-004
06-002
06-003a
06-003a
06-006
16-011
16-012
21-001
19-001
20-001
22-001
18-001
18-001
19-001
16-012
17-001
23-001
17-007b
2-001
16-008b
16-002
16-004b
16-014
16-007b
16-004a
16-003
16-018b
16-018a
17-014a

Amplifier III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23-001
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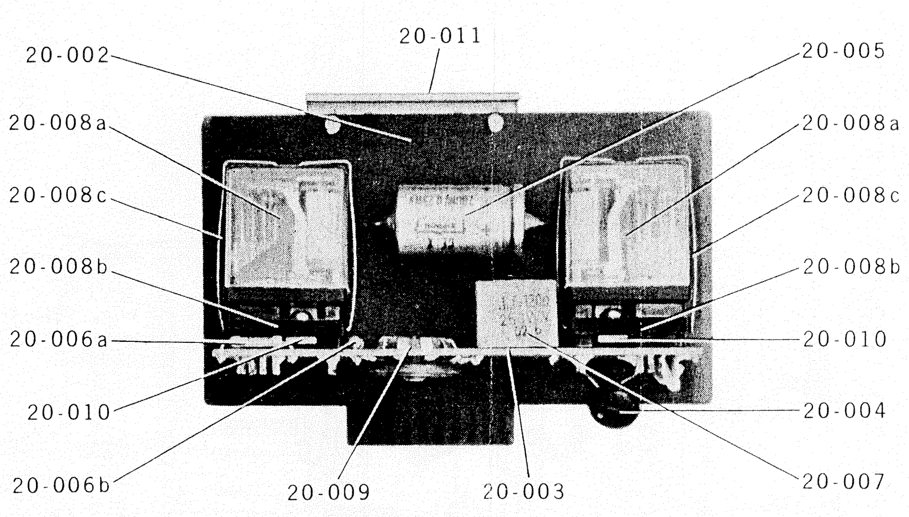
22-007b
22-008c
17-016
17-012
16-013
22-009
22-008b
22-002
22-010
22-008a
16-003
22-006
22-005
16-007b
16-007a
16-017
16-013
22-007a
22-003
22-006
22-005

Amplifier IV

RELAY BLOCK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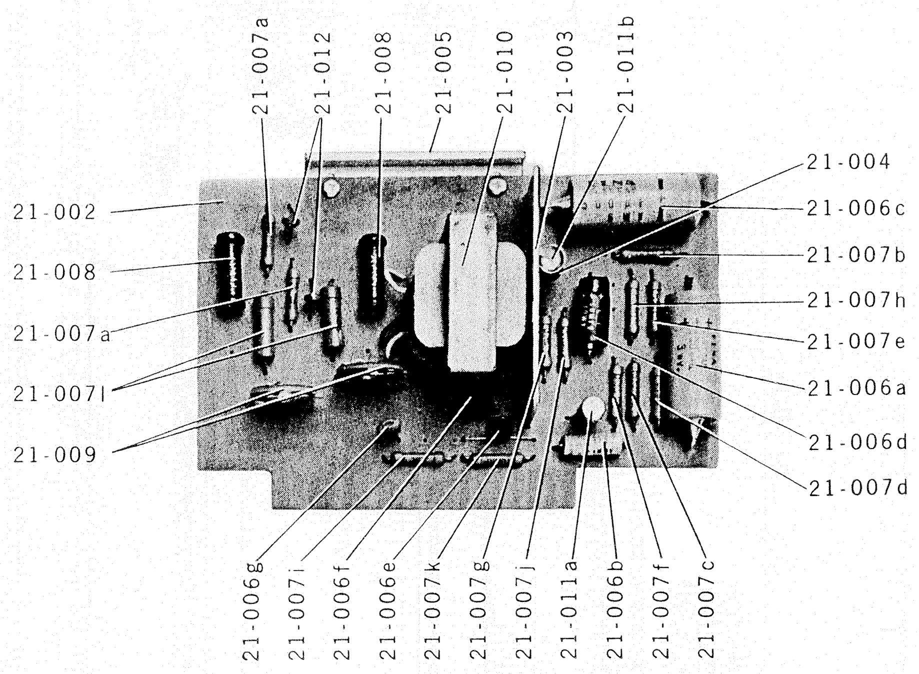
20-008a
20-008c
20-008b
20-006a
20-010
20-006b
20-011
20-009
20-003
20-005
20-008a
20-008c
20-008b
20-010
20-004
20-007

MAIN AMP. BLOCK


21-007a
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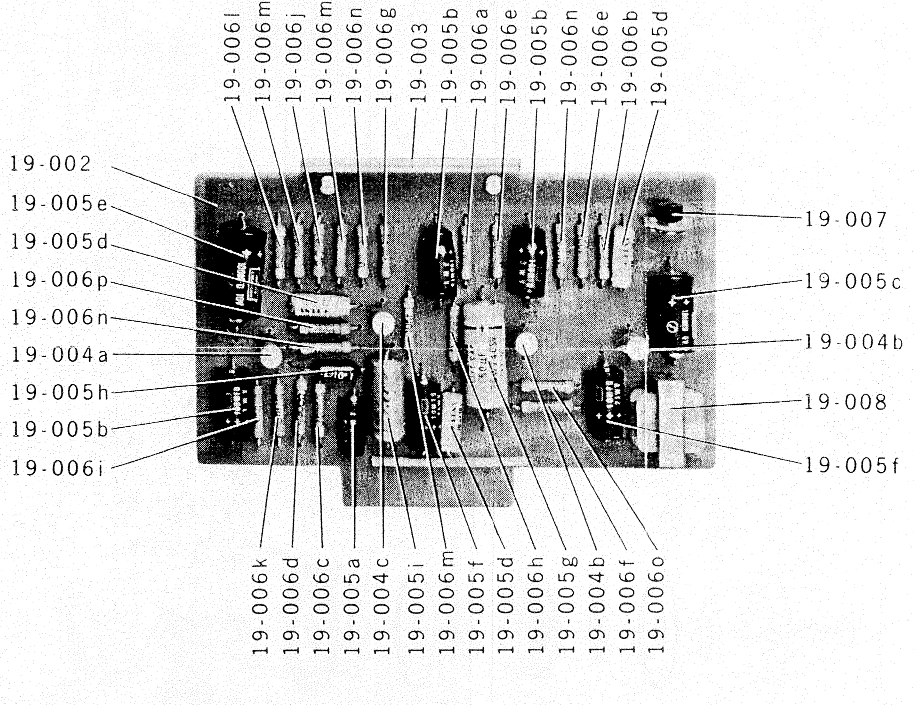
21-008
21-005
21-010
21-003
21-011b
21-002
21-008
21-007a
21-007l
21-009
21-004
21-006c
21-007b
21-007h
21-007e
21-006a
21-006d
21-007d
21-006g
21-007i
21-006f
21-006e
21-007k
21-007g
21-007j
21-011a
21-006b
21-007f
21-007c

PLAYBACK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19-003
19-005b
19-006a
19-006e
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19-006n
19-006e
19-006b
19-005d
19-002
19-005e
19-005d
19-006p
19-006n
19-004a
19-005h
19-005b
19-006i
19-007
19-005c
19-004b
19-008
19-005f
19-006k
19-006d
19-006c
19-005a
19-004c
19-005i
19-006m
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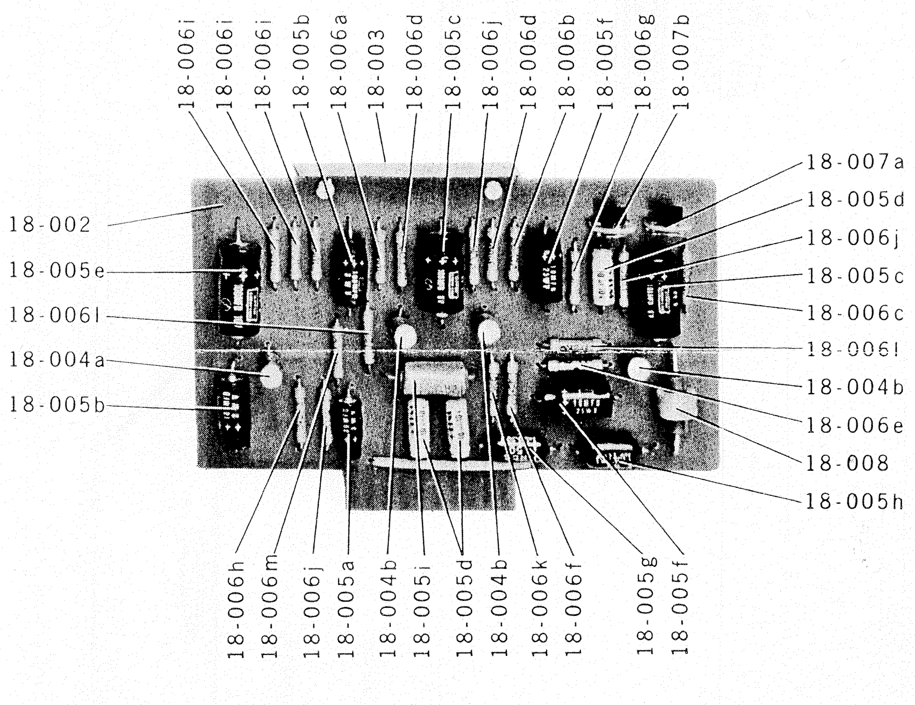
19-006h
19-005g
19-004b
19-006f
19-006o

RECORD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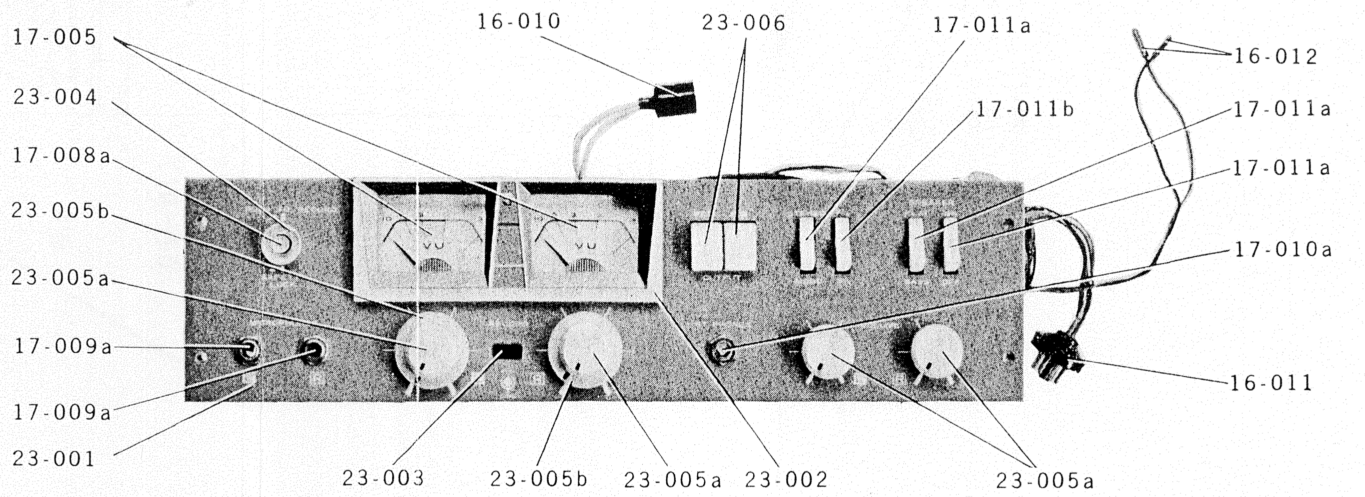
18-003
18-006d
18-005c
18-006j
18-006d
18-006b
18-005f
18-006g
18-007b
18-002
18-005e
18-006l
18-004a
18-005b
18-007a
18-005d
18-006j
18-005c
18-006c
18-006l
18-004b
18-006e
18-008
18-005h
18-006h
18-006m
18-006j
18-005a
18-004b
18-005i
18-005d
18-004b
18-006k
18-006f
18-005g
18-005f

Amplifier V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17-008a
23-005b
23-005a
17-009a
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23-006
17-011a
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17-011a
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16-011
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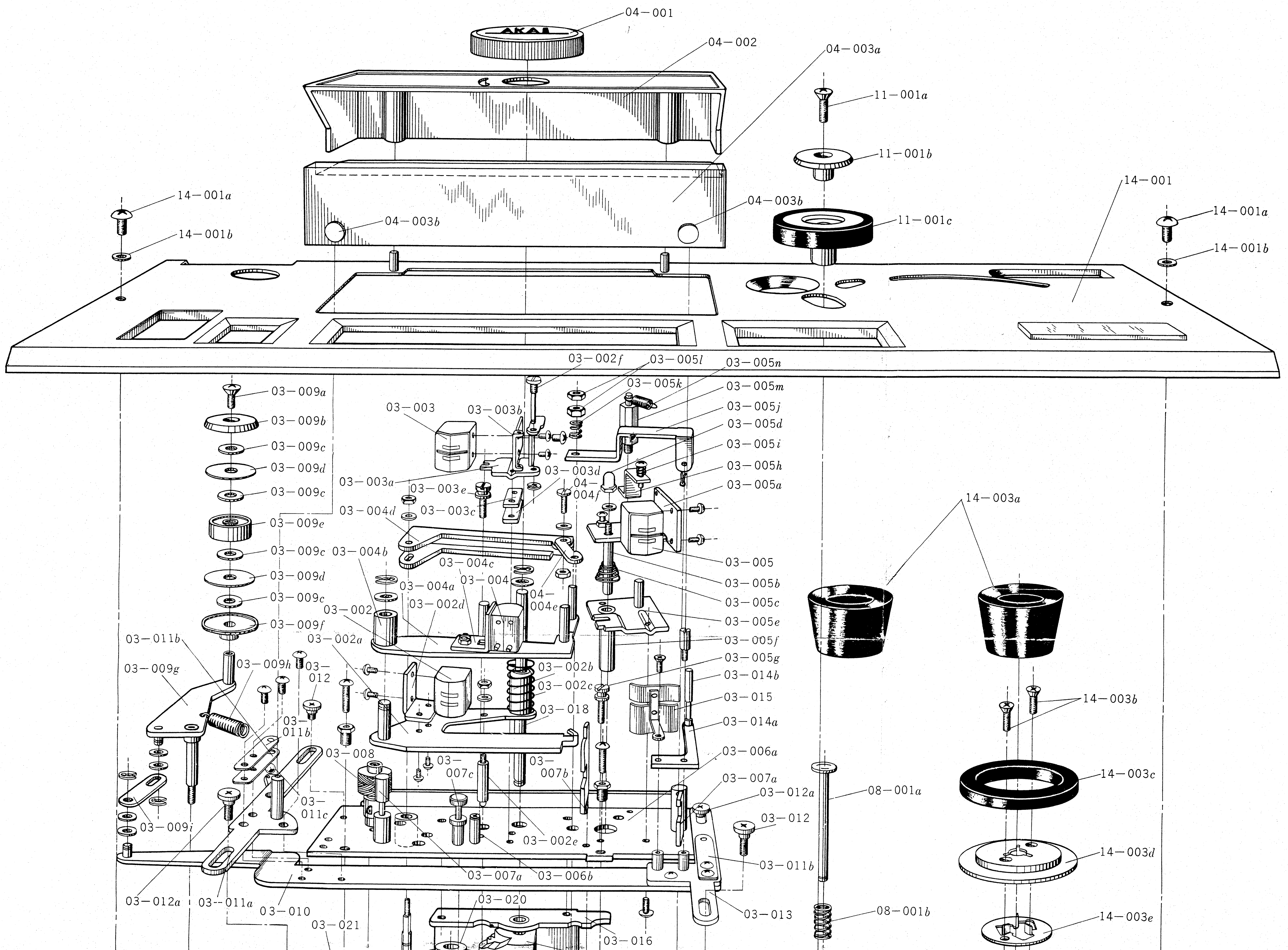
23-005b
23-005a
23-002
23-005a


AKAI
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11-001c
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03-005k
03-005m
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03-003b
03-005j
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03-009b
03-005i
03-009c
03-005h
03-009d
03-003d
03-003a
04-004f
03-005a
03-003e
03-009c
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03-003c
03-004d
03-009e
03-009c
03-004b
03-005
03-004c
03-005b
03-009d
03-004a
03-004
04-004e
03-005c
03-009c
03-002d
03-002
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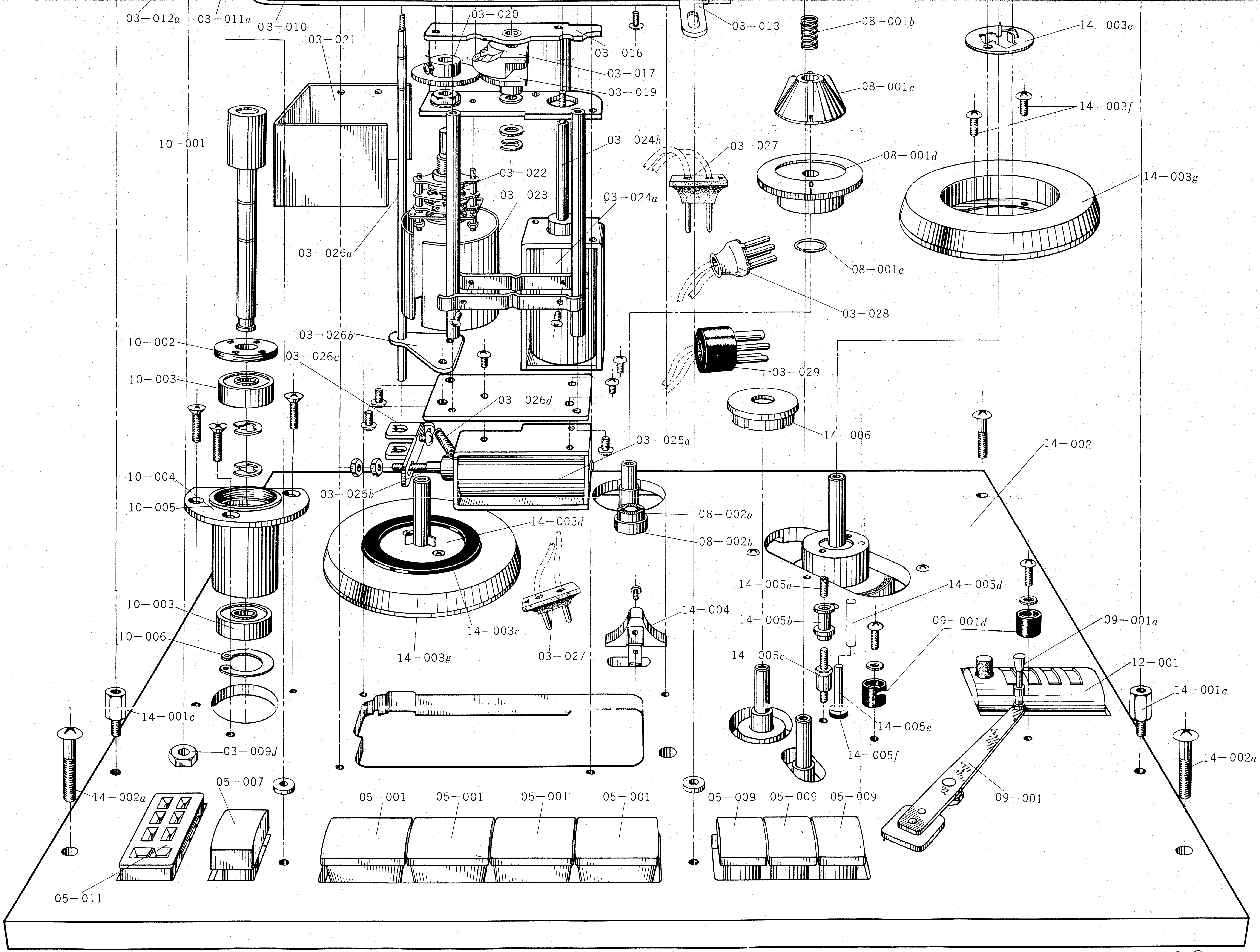
03-009f
03-005f
03-011b
03-002a
03-005g
03-009g
03-009h
03-012
03-002b
03-014b
03-002c
14-003b
03-015
03-018
03-011b
03-014a
03-008
03-007c
03-007b
03-006a
03-007a
14-003c
03-012a
08-001a
03-011c
03-012
03-009i
03-002e
14-003d
03-011b
03-007a
03-006b
03-012a
03-011a
03-010
03-020
08-001b
03-013
14-003e
03-021
03-016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03−010
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03−013
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03−017
03−019
08−001c
14−003f
10−001
03−024b
03−027
08−001d
14−003g
03−022
03−023
03−024a
03−026a
08−001e
03−028
03−026b
10−002
03−026c
03−029
10−003
03−026d
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14−002
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14−005d
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14−004
14−005b
09−001d
09−001a
10−006
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14−003g
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14−005c
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14−001c
14−001c
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14−002a
05−007
14−002a
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05−001
05−001
05−001
05−009
05−009
05−009
09−001
05−011

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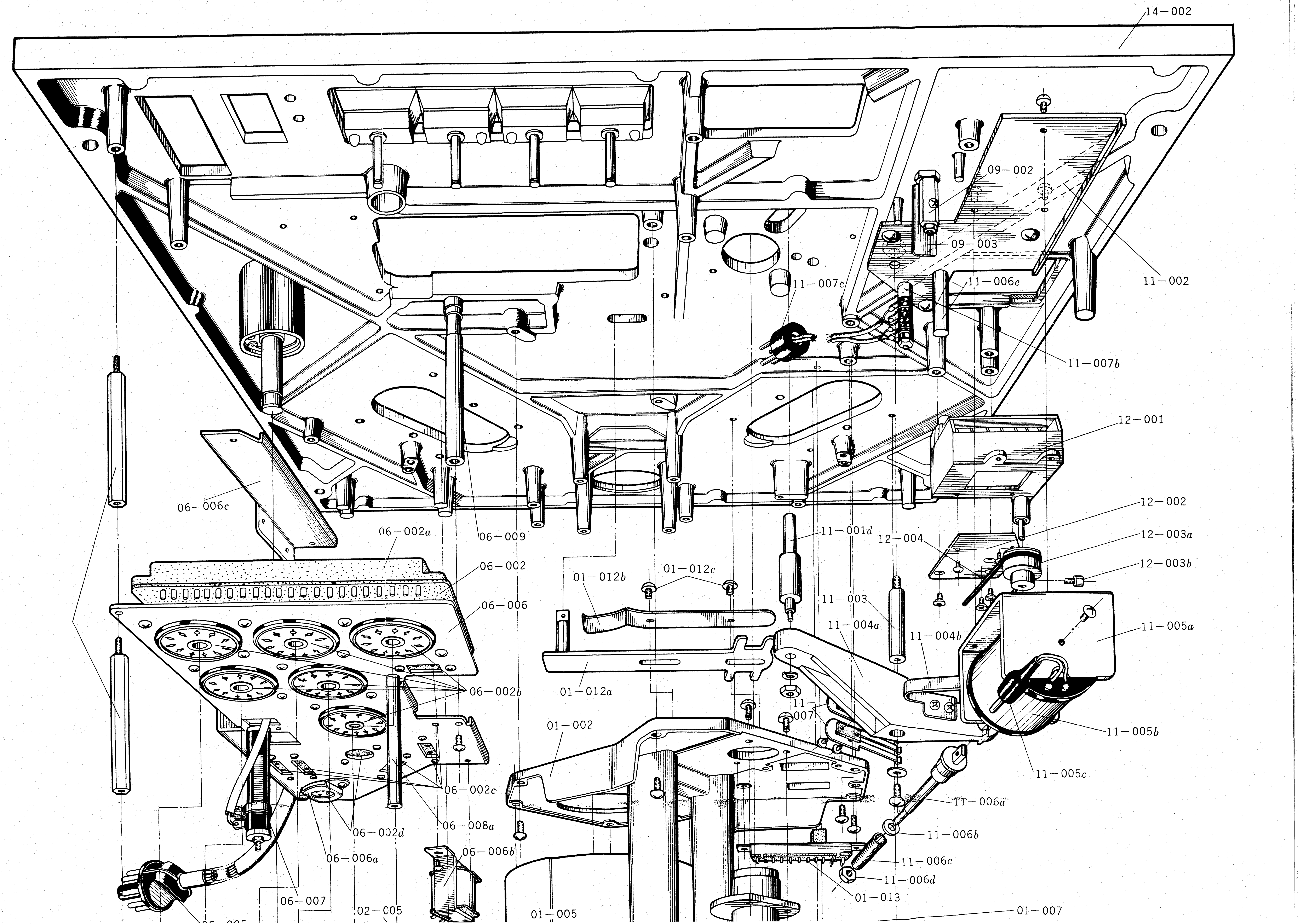
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12—001
06—006c
12—002
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06—009
11—001d
12—004
12—003a
06—002
01—012c
01—012b
12—003b
06—006
11—003
11—004a
11—005a
11—004b
01—012a
06—002b
11—
007
01—002
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11—005c
06—002c
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06—002d
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06—006b
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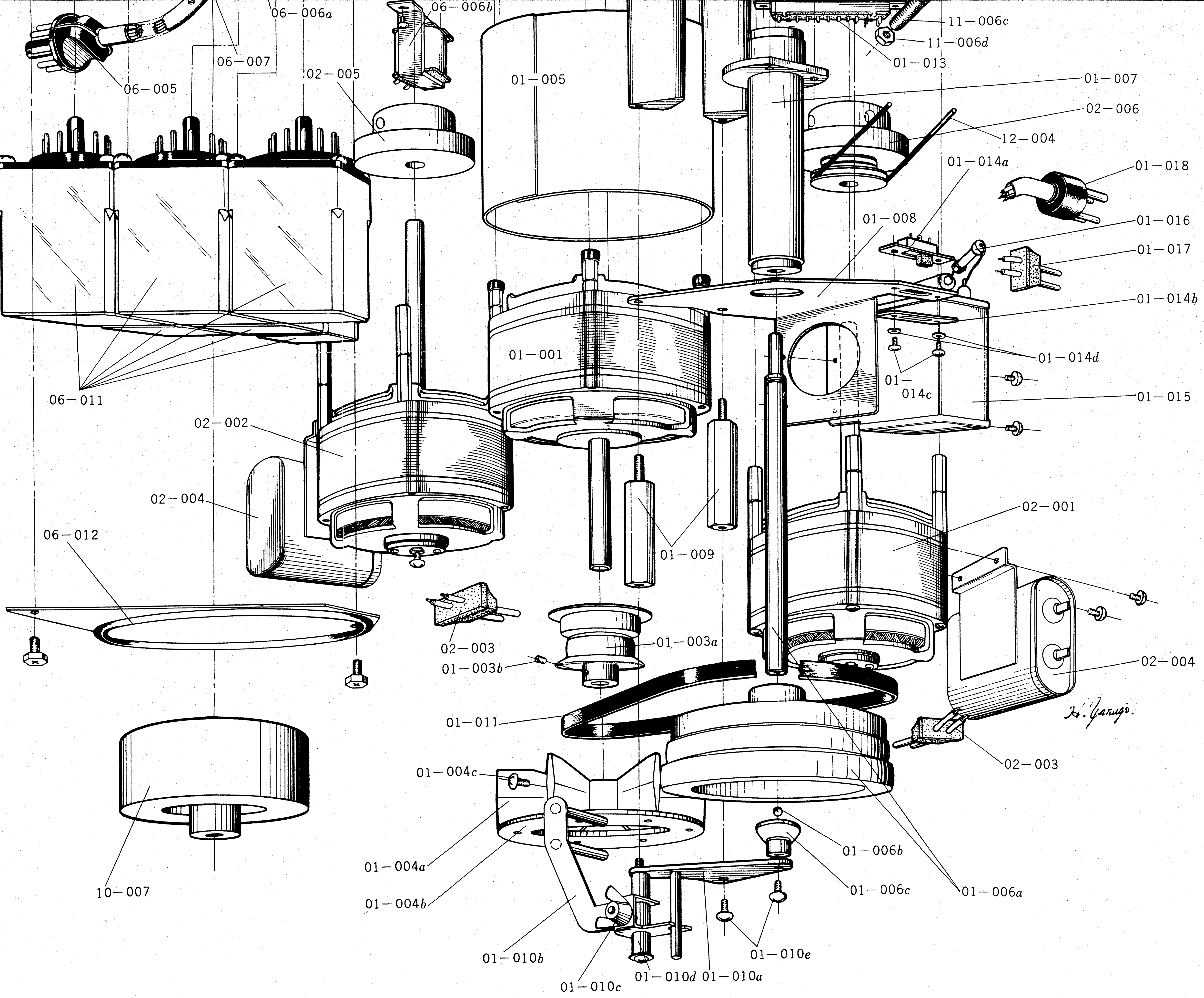
01—013
02—005
01—005
01—007
06—005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02—005
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02—006
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01—018
01—008
01—016
01—017
01—014b
01—001
01—014d
01—
014c
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01—015
02—002
02—004
02—001
01—009
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01—011
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01—004b
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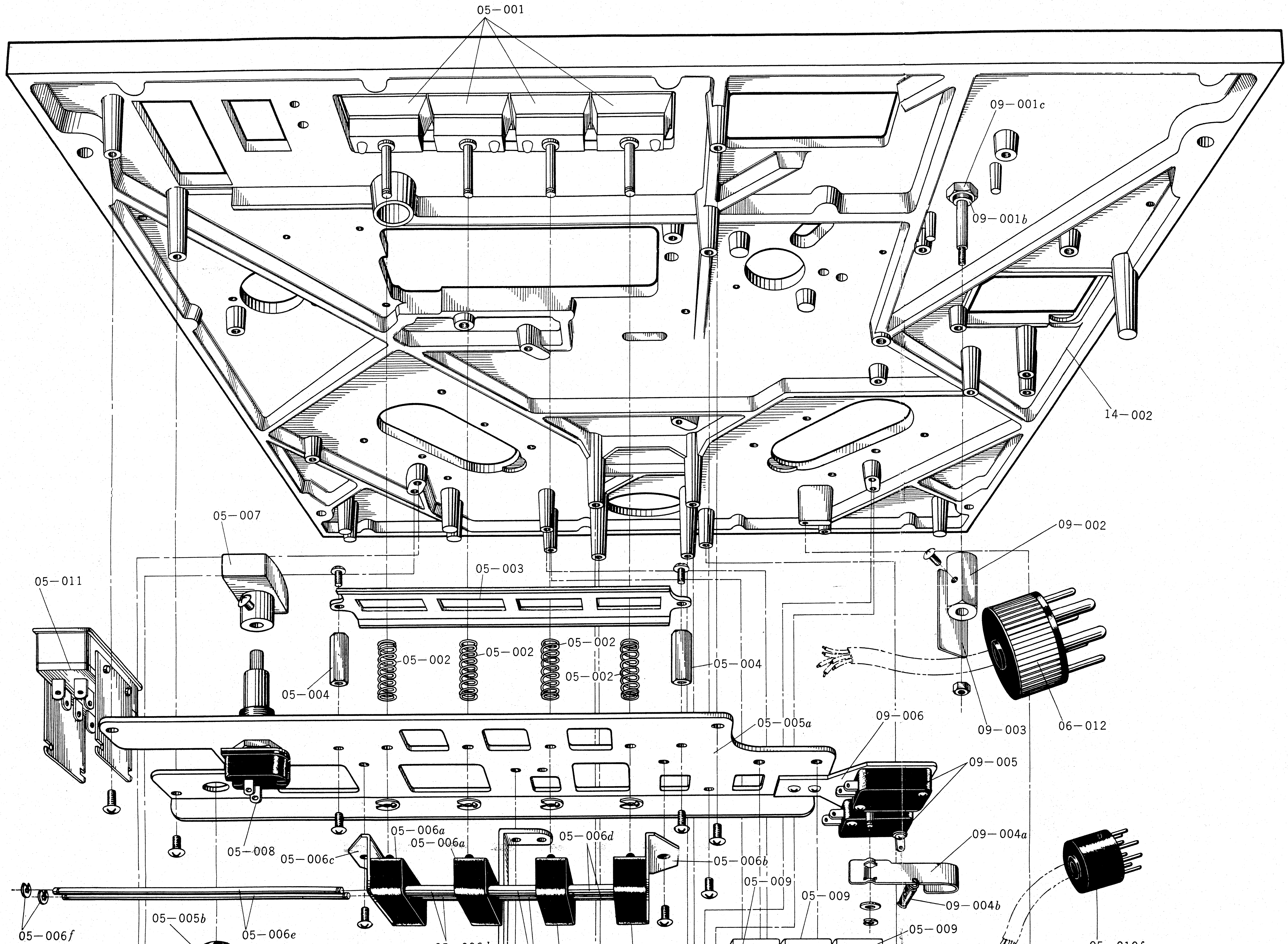
01—010b
01—010d
01—010a
01—010c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09-003
06-012
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09-004a
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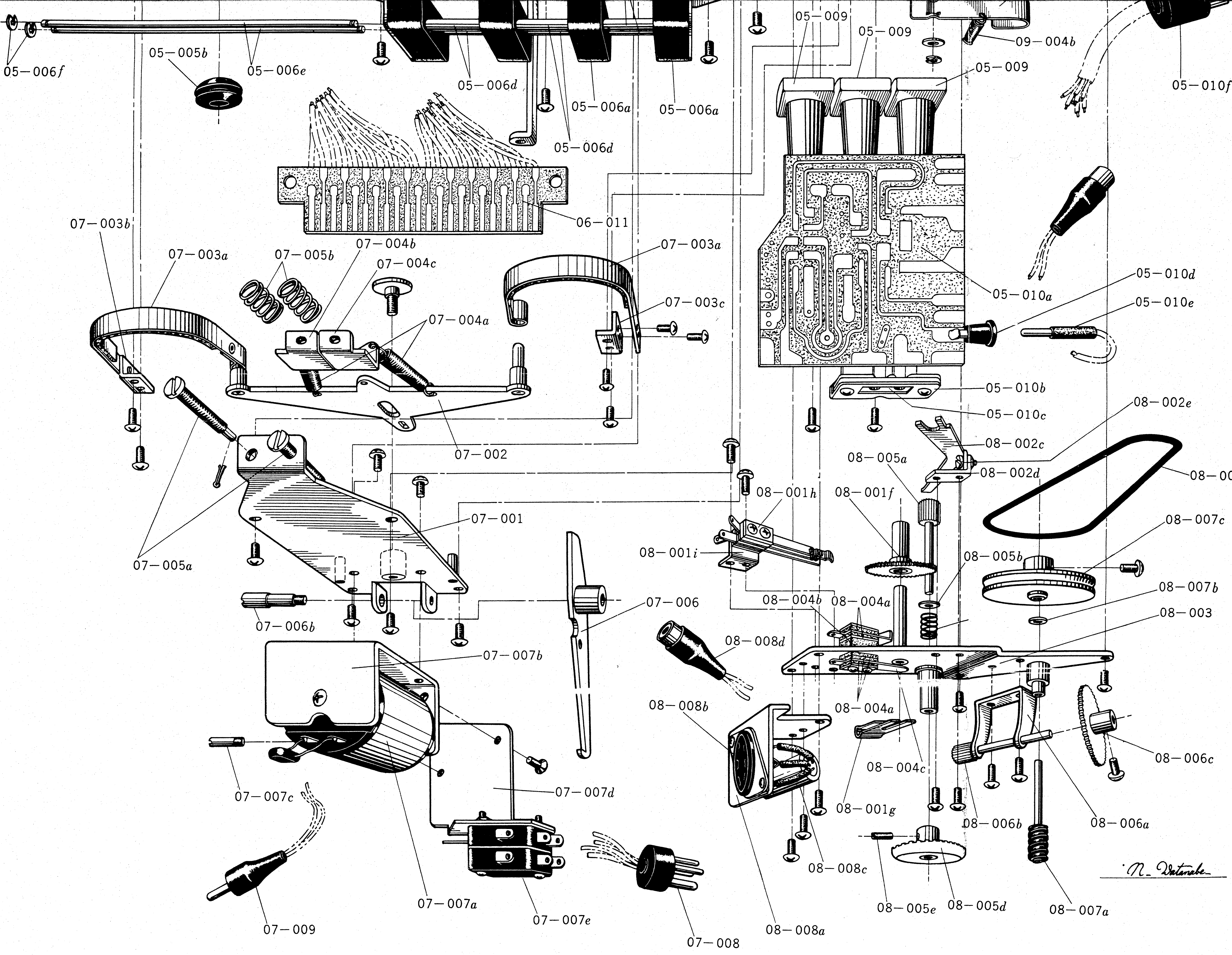
05-006f
05-005b
05-006e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07—003c
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08—001f
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07—007b
08—008b
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08—006c
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07—007d
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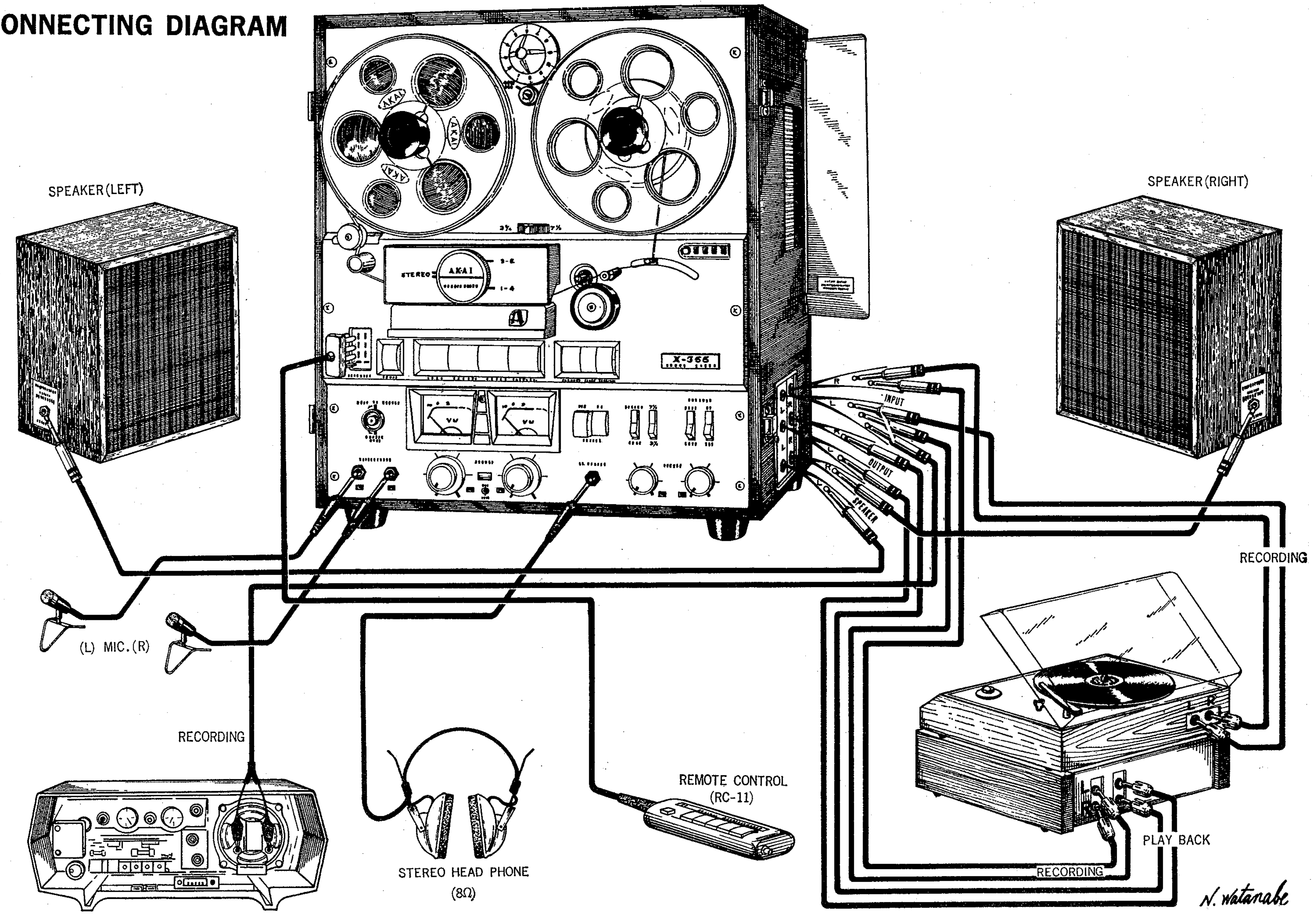
08—006b
08—006a
08—008c
07—007a
07—007e
08—005e
08—005d
08—007a
07—009
07—008
08—008a
N. Watanabe

XIII. CONNECTING DIAGRAM


SPEAKER(LEFT)
SPEAKER(RIGHT)
AKAI
STEREO
X-355
R
L
INPUT
OUTPUT
SPEAKER
RECORDING
(L) MIC.(R)
RECORDING
STEREO HEAD PHONE
(8Ω)
REMOTE CONTROL
(RC-11)
PLAY BACK
RECORDING
N. Watanabe